NATURAL HISTORY NOTES

GYMNOPHIONA — CAECILIANS

***GYMNOPIS MULTIPLICATA* (Varagua Caecilian). BIRTH.** *Gymnopis multiplicata* is a viviparous caecilian that provides post-birth maternal attendance to newborns (McCranie and Wake 2010. Herpetol. Rev. 41:483), which number 2–10 per clutch (Wake 1988. Cat. Amer. Amphib. Rept. 411.1–411.2). At 1715 h on 07 April 2012, we collected an adult female *G. multiplicata* (MVZ 269228, SVL = 328 mm, 115 primary annuli, 92 secondary annuli) and two neonate *G. multiplicata* (MVZ 269229, SVL = 107 mm, 120 primary annuli, 102 secondary annuli; MVZ 269230, SVL = 109 mm, 117 primary annuli, 98 secondary annuli) under a small wooden plank in the backyard of Hotel Río Indio Lodge, Departamento Río San Juan, Nicaragua (10.9303°N, 83.7272°W, datum WGS 84; elev. 20 m). Upon turning the plank with a rake we observed the adult female lying alongside one of the neonates and in the process of giving birth to a second neonate, which was approximately halfway out. Immediately after being exposed, the adult female tried to escape by quickly crawling away and was collected and deposited in a plastic bag. The birth of the second newborn was completed within three to five minutes, and we kept all three specimens together in a plastic bag partially filled with soil for approximately sixteen hours before preservation. No additional young were born. While examining the preserved specimens in the lab, M. H. Wake noticed that the adult female had one more intraoviductal fetus of approximately the same size as the other two newborns. The first two hatchlings came from the female's right oviduct, which was fully evacuated, and the remaining fetus was in the left oviduct. Assuming that these three fetuses constituted the whole clutch, it appears that the adult female *G. multiplicata* emptied one oviduct entirely before the other. Although the Río San Juan is one of the rainiest places in Central America and is included within Lowland Wet Forest formation, this field observation was made during the driest period of the year. This observation occurred on a day with overcast skies, but no rain, and the soil under the plank was relatively dry. No obvious food items were present.

PHOTOGRAPH BY T. W. PIERSON

FIG. 1. Adult female *Gymnopis multiplicata* with two neonates.

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CAUDATA — SALAMANDERS

***ANEIDES AENEUS* (Green Salamander). DEATH FEIGNING/IMMOBILITY.** The evolution of anti-predatory behaviors is an important component of the natural history of plethodontid salamanders. At 1325 h on 15 April 2013 in Powell Co., Kentucky, USA (37.816944°N, 83.680496°W, datum WGS84; elev. 381 m), we observed an adult *Aneides aeneus* (SVL = 5.5 cm) display immobility shortly after capture in a behavior we interpret as death feigning. The animal was gently coaxed from a cliff crevice using a small twig and quickly captured upon egress. Once in hand, within 15 seconds of capture, the animal flipped onto its back and lay limp for over three minutes. After about one minute, the animal gaped its mouth and assumed a more rigid posture. Once returned to the cliff, the animal quickly retreated into a fissure.

Anti-predatory behaviors such as immobility in response to physical contact and flipping onto the back have been reported for hatchling *Aneides* (Brodie et al. 1974. Herpetologica 30:79–85), but to our knowledge this is the first reported instance of death feigning or immobility upon contact in an adult *Aneides*. This genus is highly adapted to an arboreal existence and a primary mode of defense against predators is to wedge the body tightly into cracks and crevices (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Inst. Press, Washington, D.C. 587 pp.). Our observations suggest that death feigning may offer a second line of defense to *Aneides* if animals are extracted from their hiding places by a predator. The behavior we observed resembles Unken reflex but it differs in the strict sense because the ventral surface of *Aneides* is not brightly colored.

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***CRYPTOBRANCHUS ALLEGANIENSIS* (Hellbender). PREDATION.** Predation on all life stages of *Cryptobranchus alleganiensis* by *Lontra canadensis* (River Otter) has been assumed, but evidence of predation has not been published (Briggler et al. 2007. Hellbender Population and Habitat Viability Assessment. IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, Minnesota. 46 pp.). *Lontra canadensis* was presumably common in many *C. alleganiensis* localities, but was largely extirpated in many sites by the early 1900s due to the fur trade. River Otters have been reestablished through reintroduction efforts in many parts of the eastern USA. The effects of reintroductions on *C. alleganiensis* has been of concern due to potential for predation, disease introductions, and food competition (Nickerson et al. 2011. PLoS ONE 6:e28906). On 23 October 2013, one of us (RV) was traveling westbound on State Rt. 73 along the East Prong of Little River in the Tennessee portion of Great Smoky Mountains National Park (precise locality withheld due to conservation concerns). At 1230 h, RV pulled over to observe three *L. canadensis* in the river and photographed the predation of an adult *C. alleganiensis* by an adult *L. canadensis* for approximately four minutes. The *L. canadensis* was originally near the north river bank with the tail of the *C. alleganiensis* in its mouth. The *L. canadensis* carried the *C. alleganiensis* to the middle of the river and climbed on to a large rock where it began to consume it beginning at the tail. The *L. canadensis* went back into the water and climbed onto a second rock further upstream, where it continued feeding on the *C. alleganiensis* (Fig. 1). It stayed there briefly before reentering the river, with the *C. alleganiensis* still in its mouth, and continued upstream until no longer in view. At that time the back portion of the *C. alleganiensis*, including the entire tail, rear legs, and part of the rear body cavity, was mostly consumed. The two other *L. canadensis* were further upstream during the observation. Due to the appearance of the body and skin of the *C. alleganiensis* and changes in the position of the *C. alleganiensis* in photographs, it seems likely that it was alive during the predation event.

We thank Erik Cooper, Tiffany Beachy, and Dana Soehn for providing information about this event.

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FIG. 1. Adult *Lontra canadensis* (River Otter) feeding on an adult *Cryptobranchus alleganiensis* (Hellbender) in Little River, Tennessee.

***CRYPTOBRANCHUS ALLEGANIENSIS ALLEGANIENSIS* (Eastern Hellbender). INTRASPECIFIC AGGRESSIVE BEHAVIOR.** Males of *Cryptobranchus alleganiensis* are known for their aggressive behaviors during the breeding season, especially defending nesting sites (Bishop 1941. The Salamanders of New York. New York State Museum Bulletin. No. 324. Albany, New York. 365 pp.; Nickerson and Mays 1973. The Hellbenders: North American Giant Salamanders. Milwaukee Public Museum, Milwaukee, Wisconsin. 106 pp.; Smith 1907. Biol. Bull. 13:5–39). Such male-to-male intraspecific aggression sometimes inflicts considerable injury to an opponent; resulting in scrapes, gashes, fresh wounds to the limbs, head, flank or tail, and most injuries are likely associated with the breeding season (Hiler et al. 2005. J. Arkansas Acad. Sci. 59:88–94; Miller and Miller 2005. Southeast. Nat. 4:513–520; Pfingston 1990. Herpetol. Rev. 21:48–51). Herein we report two observations of aggressive behavior during the breeding season in male hellbenders, and one of these observations resulted in mortality of a conspecific. To our knowledge, this is the first reported observation resulting in mortality.

While conducting surveys for hellbender nests at 1115 h on 02 October 2008 on the Big Piney River, Missouri, USA (specific locality withheld due to conservation concerns), we encountered a large amount of hellbender slime scattered on the river bottom within an approximately 3 x 3 m area. A hellbender was seen lying within this area on the river bottom with its head poked into a hole under a large rock (mean rock length and width 130 and 210 cm, respectively). Upon grabbing and removing the hellbender from the hole, we observed that another hellbender had its mouth engulfed over the nostrils and half of the head. The hellbender within the hole immediately released the other hellbender and retreated slightly backward within the hole of the large rock. The hellbender that was captured was covered with large amounts of whitish skin secretions, was only slightly active, and was immediately placed in a container with water for short-term observation. The hellbender was an adult male (SVL = 34.0 cm; total length = 46.0 cm; mass = 610 g) and died within 15 minutes of capture. We were unable to remove the adult that was under the rock, but it appeared to be larger in size (i.e., larger head) and was likely a male based upon its behavior of defending the entrance tunnel of a potential nesting site. Based upon copious amounts of whitish skin secretions on the river bottom, it appears that aggressive fighting had occurred in the general area of the rock, but what happened and the length of the fighting is unknown. The animal that died had two snout wounds resembling bite-marks and fresh lacerations on the front and back left limbs indicative of bite marks by another hellbender. Necropsy was performed on the dead body and nothing else unusual was found.

At 0900 h on 24 September 2013, another similar encounter occurred between two adult male hellbenders on the Gasconade River, Missouri, USA (specific locality withheld due to conservation concerns). We observed a hellbender (SVL = 31.2 cm; total length = 47.3 cm; mass = 515 g) with its tail and partial body lying parallel to a rock (mean rock length and width of 86 and 66 cm respectively) and its head under the rock. When the hellbender was grabbed and pulled from the rock, another hellbender (SVL = 29.6 cm; total length = 46.1 cm; mass = 535 g) was immediately removed with its jaws clasped over the upper jaw and head of the visible hellbender. The hellbender released the other and both were alive and in good body condition. Upon inspection of the body, both hellbenders had characteristic snout wounds resembling bite-marks on the head.

Although eggs were not observed during either of these encounters, fierce fighting among male hellbenders during competition for good nesting sites is known to occur (Alexander 1927. Buffalo Soc. Nat. Sci. 7:13–18; Nickerson and Mays 1973, *op. cit.*; Peterson 1988. Herpetol. Rev. 19:28–29). In both of these incidences we report, the males within the holes of these rocks were likely defending nesting sites. The only other documentation with similar aggression was reported in Nickerson and Mays (1973, *op. cit.*) where an incident of strife occurred on the open river bottom between two adult Ozark Hellbenders (*C. a. bishopi*), but no mention of death was reported. Such intraspecific male-to-male aggression, especially during the breeding season, may be somewhat common in *C. a. alleganiensis*, but those resulting in death are likely a rare occurrence.

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***CRYPTOBRANCHUS ALLEGANIENSIS BISHOPI* (Ozark Hellbender). DIET.** The diet of *Cryptobranchus alleganiensis* consists predominantly of crayfish; small fishes (e.g., catostomids, cyprinids, and cottids) are the most common vertebrates in their diet (Nickerson and Mays 1973. The Hellbenders: North American Giant Salamanders. Milwaukee Public Museum, Milwaukee, Wisconsin. 106 pp.). A variety of other foods have also been reported: invertebrates include earthworms, aquatic insect larvae, insects, and snails; while vertebrate prey includes fish eggs, lampreys, hellbender eggs and conspecifics, tadpoles, toads, snakes and small mammals (Groves and Williams 2013. Herpetol. Rev. 44:651–652; Hulse et al. 2001. Amphibians and Reptiles of Pennsylvania and the Northeast. Cornell University Press, Ithaca, New York. 419 pp.; Nickerson and Mays 1973, *op. cit.*; Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, D.C. 587 pp.; Smith 1907. Biol. Bull. 13:5–39). Hulse et al. (2001, *op. cit.*) reported *Cryptobranchus a. alleganiensis* (Eastern Hellbender) occasionally eats *Necturus maculosus maculosus* (Common Mudpuppy). *Necturus m. louisianensis* (Red River Mudpuppy) occurs syntopically with the regionally endemic *Cryptobranchus a. bishopi* (Ozark Hellbender) in rivers of the southern Ozark Plateau of Arkansas and Missouri, and mudpuppies are frequently encountered during hellbender monitoring work. We report here the first recorded instance of an Ozark Hellbender feeding on the Red River Mudpuppy.

While checking a series of artificial nest boxes for the presence of egg clutches on 23 October 2012 in the Eleven Point River, Randolph Co., Arkansas, USA (precise locality data withheld due to federal endangered species status of the Ozark Hellbender), four adult male Ozark Hellbenders were collected within adjacent habitat. All four of these individuals had been previously captured and PIT tagged as part of an ongoing long-term population monitoring project (KJI). One of these males (SVL = 29.5 cm; total length = 45.7 cm; mass = 497 g) was initially captured in 2007, and while temporarily housed in a plastic storage tub it regurgitated an adult *N. m. louisianensis* (ASUMZ 33029; SVL = 18.0 cm; total length = 25.0 cm; mass = 83 g; Fig. 1). The mass of the *Necturus* represents 16.7% of the body weight of the *Cryptobranchus*. The *Necturus* exhibits significant tissue damage along the midline of the dorsum, with some separation of the musculature along the axial plane of the vertebral column, in what appears to be two distinct bite marks. The venter lacks any discernable tissue damage. The orientation of the bite marks suggests that the *Cryptobranchus* approached and grabbed the *Necturus* from the lateral aspect. In over a decade of field work, and many hundreds of *Cryptobranchus* captures, this is the first instance that we have observed predation of *Necturus* by *Cryptobranchus*.

FIG. 1. Adult *Necturus maculosus louisianensis* (on right) regurgitated by an adult male *Cryptobranchus alleganiensis bishopi* (on left), Eleven Point River, Randolph Co., Arkansas, USA.

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***DESMOGNATHUS FOLKERTSI* (Dwarf Black-bellied Salamander). PREDATION.** *Desmognathus folkertsi* is a recently described species (Camp et al. 2002. Herpetologica 58:471484), and predators have not been previously documented. On 01 July 2010 at approximately 1030 h we discovered a subadult *D. folkertsi* as it was being eaten by a juvenile *Nerodia sipedon* (Northern Watersnake). The location was a small, 1st order stream in Habersham Co., Georgia, USA (34.66840°N, 83.36798°W; datum WGS 84). The watersnake had seized the center of the body of the salamander, which writhed and bit, including biting its own leg (Fig. 1). The salamander was re-growing a previously lost tail, possibly indicating that it had survived an earlier predatory attack. Tail autotomy is an anti-predatory behavior characteristic of many salamanders including *Desmognathus* (Labanick 1984. Herpetologica 40:110–118). Although this is a first record of predation

FIG. 1. *Nerodia sipedon* feeding on a juvenile *Desmognathus folkertsi*.

upon *D. folkertsi*, several species of the genus *Nerodia* including *N. sipedon* are known to eat desmognathine salamanders (Gibbons and Dorcas 2004. North American Watersnakes: A Natural History. University of Oklahoma Press, Norman. 438 pp.).

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***EURYCEA CIRRIGERA* (Southern Two-lined Salamander). PAEDOMORPHOSIS.** On 19 January 2014, we discovered what appeared to be a large (SVL = 38 mm; total length = 75 mm), but typically marked, *E. cirrigera* larva in a small, impounded stream in Athens, Clarke Co., Georgia, USA (33.8909°N, 83.3624°W; datum: WGS84). However, the larva was visibly gravid; developing ova could be seen through her transparent ventral skin. The salamander was euthanized and dissected and found to have 27 distinct ova in her right oviduct and 24 ova in her left oviduct. This falls within the typical clutch size of the species (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, DC. 587 pp.). Tissues from the female and her eggs were preserved in 95% EtOH, and deposited as GMNH 50696. To the best of our knowledge, the only other report of neoteny in *E. cirrigera* was from Mount (1975. The Amphibians and Reptiles of Alabama. University of Alabama Press. 268 pp.), who described it as "not uncommon" in Alabama. Rose and Bush (1963. Tulane Stud. Zool. 10:121–128) describe several male and female *E. aquatica* with well-developed testes and ova, but report that all had typical adult coloration and classify their status as representative of "precocious reproductive development and not true neoteny". No other published accounts of neoteny in the *Eurycea bislineata* complex exist. We revisited the site of collection and nearby streams on 26 January 2014 and collected 53 *E. cirrigera* larvae, but all were smaller than the gravid female and none had visible developing ova. Metamorphosed adult female *E. cirrigera* were gravid during this time. Additionally, we examined 74 *E. cirrigera* larvae of at least 30 mm SVL in the GMNH collection, and none of them appeared to be gravid females.

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PHOTOGRAPH BY T. W. PIERSON

FIG. 1. Dorsal and ventral view of paedomorphic female *Eurycea cirrigera*.

***EURYCEA TYNERENSIS* (Oklahoma Salamander). TERRESTRIAL OVIPOSITION.** *Eurycea tynerensis* is a plethodontid that inhabits streams of the Ozark Plateau in Oklahoma, Arkansas, and Missouri, USA. This is one of a few species of plethodontids that exhibit alternative life histories, including paedomorphosis and metamorphosis among populations, with some populations displaying both life histories (Bonett and Chippindale 2004. Mol. Eco. 13:1189–1203). Very little is known about the reproductive biology of paedomorphic *E. tynerensis*, and to date, paedomorphic *E. tynerensis* egg clutches have only been observed once in the wild (Trauth et al. 1990. Proc. Arkansas Acad. Sci. 44:107–113). Lack of observations is likely due to their aquatic lifestyle and affiliation with subterranean strata. Therefore, captive specimens may offer the best opportunity to document novel reproductive behaviors. Here we report multiple instances in captivity of a paedomorphic *E. tynerensis* depositing eggs above the waterline.

Our first observation took place in 2012, however no data was recorded. On 24 September 2013, another captive paedomorphic female *E. tynerensis* deposited four eggs on the inside edge of a large cattle tank above the water line. The female believed to have laid these eggs deposited a total of 15 eggs (on both terrestrial and aquatic surfaces), but oviposition was never witnessed. The presumed mother was also observed above the water line. On 12–13 October 2013, terrestrial oviposition by multiple female *E. tynerensis* from the same locality was observed, with a total of 30 eggs being deposited above the waterline and 31 deposited within water. Distance of the eggs from the waterline ranged from 2–16 cm (mean = 6.78 cm). The same captive facility houses seven additional populations of paedomorphic *E. tynerensis* (raised in a similar manner), none of which have exhibited terrestrial oviposition, even though over 20 clutches of eggs have been deposited.

Most *Eurycea* are known to deposit eggs in clutches on the undersides of submerged rocks or other debris in streams (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, DC. 587 pp.). Terrestrial oviposition in *E. tynerensis* appears to be a grave event and eggs that are not transferred into water quickly became desiccated. However, given that this behavior was observed multiple times from at least three individuals, terrestrial oviposition may

be a recurring phenomenon in certain populations. Additional field observations are needed to determine the adaptive significance, if any, of this phenomenon.

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***NECTURUS MACULOSUS* (Common Mudpuppy). LARVAL GUARDING.** Larval defense and attendance of eggs and young by adults is a widespread behavior among salamanders (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, D.C. 587 pp.). During salamander surveys in the Licking River watershed, Rowan Co., Kentucky, USA (precise locality withheld due to conservation conerns), we observed two separate instances of adult *N. maculosus* attending broods of larvae at different stages of development between 1045 h and 1150 h on 11 September 2013. Both aggregations were found by lifting large flat rocks in a stream approximately one meter in depth. The first adult *N. maculosus* (22 cm SVL) was in attendance of at least 32 larvae ranging from 4–5 cm in total length and the second adult *N. maculosus* (19 cm SVL) was in attendance of at least 25 larvae approximately 3–4 cm in total length. When initially uncovered, both females were coiled around a tightly aggregated group of larvae at the center of the space under the cover rock. Remnants of hatched eggs were evident on the underside of the rock concealing the smaller larvae, but were not detected under the other rock.

Adult *Necturus* have been reported to attend and guard clutches of eggs on the undersides of submerged flat rocks through hatching (Bishop 1941. New York State Mus. Bull. 324:13–65), but to our knowledge this is the first reported instance of larval attending in this species. We feel confident in describing these observations as larval attending rather than recently hatched nest guarding behavior because Bishop (1941, *op. cit.*) described *Necturus* hatchlings as measuring between 2.1–2.5 cm total length and our observed larvae were larger at approximately 3–5 cm total length. Breeding season and date of oviposition vary across the range of *N. maculosus*. Because larvae were found in September in this part of the range, copulation in central Kentucky may occur in the spring and eggs may be deposited in early to mid- summer. Larval *Necturus* may face strong predation pressures from fish, crayfish, invertebrates, and conspecifics, and the expression of larval attendance phenotypes in this species may be more prevalent in portions of the range where egg hatching coincides with low water levels and higher predator densities.

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***NOTOPHTHALMUS VIRIDESCENS* (Eastern Newt). SPERM MOTILITY.** Amphibian sperm have received considerable attention in recent years because of the possibility of conserving genetic information and the propagation of threatened taxa. However, our understanding of sperm physiology in amphibians is rather limited, even on sperm in taxa that have been investigated for the explicit purpose of understanding sperm physiology.

Sperm transport and activation in male *N. viridescens* were studied in detail by Hardy and Dent (1986a. J. Exp. Zool. 240:385–396; 1986b. J. Morphol. 190:259–270). They reported that sperm were immotile in the Wolffian ducts and motile in the periphery of the spermatophore cap (also confirmed in Ambystomatidae and other salamandrids; Russel et al. 1981. Tiss. Cell. 13:609–621; Zalisko et al. 1984. Copeia 1984:739–747). Thus, activation of newt sperm must take place during, or immediately preceding, spermatophore formation. Hardy and Dent (1986a, *op. cit.*) concluded exposure of the spermatophore to pond water (hypoosmotic shock) was the initiating factor for axoneme activation and that sperm motility alone did not account for sperm reaching the simple spermathecae in female *N. viridescens* because sperm in natural inseminations traveled as far as 5 mm in less than 2 minutes. This distance could not possibly be traversed by sperm activated by hypoosmotic shock (Hardy and Dent 1986a, *op. cit.*). Thus, another mechanism modulating sperm swimming speed (or degree of activation) must be present.

While testing hypotheses on the function of secretions from the sexual collecting ducts of *N. viridescens* (see Siegel et al. 2012. J. Herpetol. 46:136–144), we observed an interesting finding: sperm are motile in the Wolffian ducts of *N. viridescens*. This finding contradicts the previous findings of Hardy and Dent (1986a, *op. cit.*). We examined freshly excised sperm from the Wolffian ducts of ten male *N. viridescens* captured on 05 November 2011 from Crawford Co., Missouri (37.94774°N, 91.16793°W; WGS 84). Specimens were euthanized with a lethal dose of MS-222 before sperm excision. We can only conclude that the error by Hardy and Dent (1986a, *op. cit.*) was due to examining desiccated sperm at the periphery of their sperm preparations.

Sperm in the Wolffian ducts of *N. viridescens* are motile, at least during November, in specimens collected from Missouri. Interestingly, Hardy and Dent (1986a, *op. cit.*) also collected salamanders in November. Historic studies on other salamander taxa also noted motility of sperm from the Wolffian ducts; e.g., Smith (1907. Contr. Zool. Lab. Univ. Michigan 109:5–39) stated in reference to sperm from the Wolffian ducts of *Cryptobranchus allegheniensis*, "the spermatozoa were motile; the motion of the shaft is slow as compared with other forms, but that of the undulating membrane is rapid." Smith (1907, *op. cit.*) noted that sperm remained motile longer in seminal fluid mixed with water (4 h) than in water alone (15 min), indicating that pure water might actually have an inhibiting effect on sperm motility. Smith (1907, *op. cit.*) also noted that sperm were not motile from the Wolffian ducts outside of the mating season. Moreover, it has long been suggested that the male excurrent ducts are the sites for maturation of salamander sperm (McLaughlin and Humphries 1978. J. Morphol. 158:73–90; Matsuda 1986. Gam. Res. 14:209–214), and it appears that this maturation includes activation of the axoneme in *N. viridescens*. From a study on *Ambystoma texanum* (Russell et al. 1981, *op. cit.*), sperm activation apparently takes place in the distal portion of the Wolffian ducts, as whorls of motile sperm were described. Sperm were not active more proximally. Furthermore, it has also been proposed that secretory activity of the Wolffian duct epithelium may act to sustain sperm motility while stored (Zalisko and Larsen 1988. Scan. Micro. 2:1089–1095).

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SUPPLEMENTARY MATERIAL: For a video of sperm excised directly from the Wolffian ducts of *Notophthalmus viridescens*, contact D. Siegel (dsiegel@semo.edu). In the video, motility of the entire mass of sperm and many sperm tails is obvious.

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***NOTOPHTHALMUS VIRIDESCENS* (Eastern Newt). DIET.** *Notophthalmus viridescens* is a common aquatic salamander across the eastern United States, and they are known to play important roles as predators in freshwater ecosystems (Morin 1981. Science 212:1284–1286; Smith 2006. Oecologia 148:342–349). *Notophthalmus viridescens* is known to prey upon aquatic invertebrates, conspecific larvae, anuran tadpoles and eggs, and fish (Burton 1977. Copeia 1977:139–143; Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, DC. 587 pp.). They may also be scavengers, as evidenced by a single report of cannibalism on dead conspecifics (Pitt et al. 2011. Herpetol. Rev. 42:258). Here I describe *N. viridescens* scavenging dead minnows.

On 08 and 15 April 2013, I observed a total of four *N. viridescens* eating, or attempting to eat, dead juvenile *Luxilus cornutus* (Common Shiner) minnows in the shallows of a large pond in Pennsylvania State Game Lands 176, Centre Co., Pennsylvania, USA (40.80200°N, 77.94300°W; datum WGS84). Three *N. viridescens* were seen repeatedly biting floating *L. cornutus* (approximately 5 cm total length), a very common fish in this pond. One *L. cornutus* was also being grasped by a backswimmer (*Notonecta* sp.), which caused the corpse to move periodically as it swam. It did not appear that any flesh was removed when any of these *N. viridescens* bit the dead *L. cornutus*. A fourth, female *N. viridescens* was seen with the posterior half of a *L. cornutus* protruding from its mouth. It was captured with a net but immediately regurgitated the fish. It is doubtful that it could have successfully swallowed the entire *L. cornutus*, and none of the other *N. viridescens* observed appeared to have successfully consumed any of the fish. Live *L. cornutus* that were smaller, and thus might be swallowed by *N. viridescens*, were abundant. These observations provide evidence that *N. viridescens* may also be important scavengers of small fish, in addition to their role as predators, in lentic habitats.

I thank Jay Stauffer and his lab for identifying the minnow species. Funding was provided by the National Science Foundation (award #1311451 to T. Langkilde and B. E. Carlson) and the research was approved by Penn State University IACUC (#41757).

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***PARAMESOTRITON LONGLIENSIS* (Longli Warty Newt). DEFENSIVE BEHAVIOR.** Salamanders and newts are well known to show defensive posture against a predator. Usually they roll up the ventral sides of body and tail to show the bright coloration (Duellman and Trueb 1986. Biology of Amphibians. The Johns Hopkins University Press, Baltimore. 670 pp.). Here we report a defensive behavior of *Paramesotriton longliensis* (Longli Warty Newt). At 2050 h on 30 March 2011, we found an adult female of *P. longliensis* (mass = 15.2 g) in a stream (depth ca. 1.2 m, width ca. 15 m) at Muye, Youyang County, Chongqing Municipality, China (29.27475°N, 109.00044°E; datum WGS84; elev. = 874 m). Water temperature was 15.0°C and air temperature was 11.0°C at capture. Immediately upon capture by a dip net, the newt laterally curved its body and coiled its tail, with its limbs folded and the coiled tail kept on the head (Fig. 1). A noxious smell emitted probably from body, but we could not observe any visible secretion. The newt did not move even in hand and also after kept in a plastic bag with water for more than several minutes. Similar behavior was also reported for other *Paramesotriton* sp. (Brodie 1983. *In* Margaris et al. [eds.], Plant, animal, and microbial

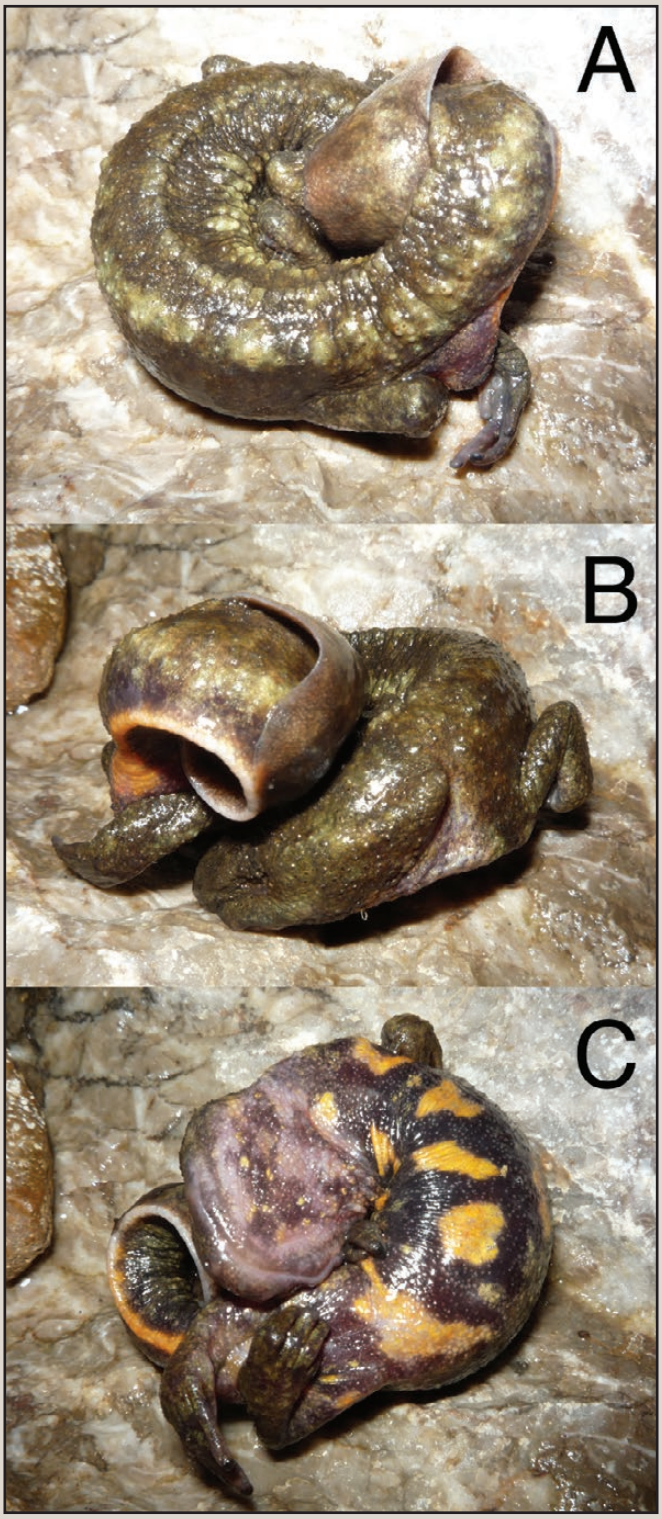

FIG. 1. Antipredator defense of a female *Paramesotriton longliensis*. A) Dorsal, B) lateral, C) ventral views.

adaptations to terrestrial environment, pp. 109–133. Plenum, New York), however, to our knowledge this is the first record of this behavior in this species.

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***SALAMANDRA LONGIROSTRIS* (Prebetic Zone Fire Salamander). DIET.** Non-vertebrate prey are well known to be consumed by *Salamandra longirostris* (García-París et. al. 2004. *In* Ramos et al. [eds.], Fauna Iberíca, Vol. 24, p. 79. Museo Nacional de Ciencias Naturales, CSIC, Madrid, Spain), but vertebrate prey, to my knowledge, have never been reported. Two partially-digested *Pleurodeles waltl* (Spanish Ribbed Newt) larvae, each with a head width of approximately 4.2 mm, were found in the gut of a male *S. longirostris* (CM 54272) collected at 2030 h on 29 November 1970. The salamander was found dead but in otherwise good condition on roadway C-440 approximately 12 km SE of Casas del Castaño, Cádiz Province, Spain (36.21762°N, 5.57583°W, datum WGS84; elev. 107 m). Its total length in preservative is 196.5 mm. In addition to adding larval salamanders to the diet of adult male Fire Salamanders, at least in extreme southern Spain, this finding also suggests the species may actively forage in aquatic environments.

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ANURA — FROGS

***COLOSTETHUS RUTHVENI* (Santa Marta Poison Arrow Frog). DIET.** *Colostethus ruthveni* is an endemic species found from the northwest flank of the Sierra Nevada de Santa Marta, Magdalena, Colombia; its distribution is estimated to be less than 5000 km^2. It resides along streams in cloud forests and dry tropical forests near the Caribbean coast (elev. <1540 m). It is considered endangered on the IUCN Red List of Threatened Species and its greatest threat is habitat loss and degradation due to agriculture, forest clearance, and infrastructure development (González-Maya et al. 2011. JoTT 3:1633–1636; Kaplan 1997. J. Herpetol. 31:369–375; Rueda-Solano and Castellanos-Barliza 2010. Acta. Biol. Col. 15:195–206). The food habits of this species are unknown, as well as many aspects of its ecology.

The study area has humid and wet tropical forests and is known as Bañaderos region and Camarones River's high basin. It is located in the south of the Riohacha municipality in La Guajira department. Sampling (approximately 165 person h effort) was conducted via visual encounter surveys carried out between 0700 h and 1800 h during 05–20 September 2011, in the basins of Camarones and Tapias rivers at three sites (11.0454°N, 72.5329°W; 11.0204°N, 72.5610°W; 11.0322°N, 72.5924°W; datum: D-Magna; elev. 408–710 m). The collected individuals were measured, preserved in ethanol, and dissected for the extraction of stomach contents. The prey was identified to order, family, and genus when possible, and the surface occupied by each prey type was measured using the coverage method (Tresierra and Culquichicon 1993. Manual de Biología Pesquera, pp. 47–56.Trujillo, Perú).

TABLE 1. Composition of prey in the diet of *Colostethus ruthveni* from Bañaderos region, Riohacha, Colombia.

Prey	Area mm^2 (%)	Frequency of occurrence
Arachnida		
Acari	0.5 (0.39)	1
Insecta		
Coleoptera		
Staphylinidae	6 (4.60)	1
Bruchidae	40 (30.8)	1
Curculionidae	4 (3.10)	1
Family Unknown	3 (2.30)	1
Hemiptera	0.5 (0.40)	1
Hymenoptera		
Formicidae		
Neivamyrmex sp.	11 (13.45)	9
Aphaenogaster sp.	11 (13.45)	9
Myrmicinae (Queen)	21 (16.2)	6
Solenopsis sp.	1.5 (1.20)	4
Larvae sp. 1	31 (23.8)	1

We examined 26 stomachs of *C. ruthveni* collected on the banks of streams inside the forest. 73.19% were found with stomach contents (N = 26; SVL = 1.9–2.31 cm, mean SVL ± S.D. = 2.09 ± 0.12 cm; Table 1). The diet consisted mainly of arthropods. Insects (Hymenoptera, Coleoptera, Hemiptera, and an unidentified larva) were the most important prey items (with more abundance and covered surface area), followed by scarce examples of arachnids (especially Acari). Coleopterans were the most important in surface coverage; however, it is worth noting that Bruchidae is represented by a single prey with large size consumed by a single *Colostethus ruthveni* individual. Numerically, the most important prey items were ants. Ants of the genus *Neivamyrmex* and *Aphaenogaster* occurred most frequently in the examined stomachs.

In Cordoba's region, in the north of Colombia, *Colostethus inguinalis* consumes beetles as the most important volumetric prey and ants as the most important numeric prey (Blanco-Torres et al. 2013. Herpetol. Rev. 44:493) which is totally consistent with *C. ruthveni*'s diet; however, the genus of Coleoptera and ants consumed differ between the two species. We also report the ingestion of mites (Acari) by *C. ruthveni*. Our contribution to the knowledge of the diet of *C. ruthveni* may be useful to management and conservation plans for this endemic species and its habitat.

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***DENDROPSOPHUS PSEUDOMERIDIANUS* (Small Tree Frog). PREDATION.** There are reports of spiders preying on tadpoles (e.g., Luiz et al. 2013. Herpetol. Notes 6:451–452; Santos-Silva 2013. Herpetol. Notes 6:193–194), as well as some adults of the hylid genus *Dendropsophus* (e.g., Oliveira et al. 2010. Herpetol. Notes 3:299–300; Toledo 2005. Herpetol. Rev. 36:395–400). The frog *D. pseudomeridianus* occurs in lowlands of Rio de Janeiro and Espírito Santo states, southeastern Brazil. This species reproduces in marshes and deposits eggs on the surface of the water (Izecksohn and Carvalho-e-Silva 2010. Anfíbios do Município do Rio de Janeiro. UFRJ Press, Rio de Janeiro. 198 pp.). The tadpole of *D. pseudomeridianus* is nektonic, inhabits lentic water, and preys upon microorganisms (McDiarmid and Altig 1999. Tadpoles: The Biology of Anuran Larvae. Univ. Chicago Press, Illinois. 444 pp.). Wolf spiders (family Lycosidae) are usually ground-dwelling hunters and many species are diurnal. They use their relatively good vision and strong venom to capture and kill their prey. At 1930 h on 17 February 2014 in the Municipality of Guapimirim, state of Rio de Janeiro (22.35735°S, 42.571943°W; datum SAD69), we noted a young male wolf spider (*Hogna* sp.) capturing a *D. pseudomeridianus* tadpole on the surface of the water of a permanent pond. The spider (length = 6.4 mm) held the tadpole's tail with its chelicerae, but released it when disturbed. The tadpole had a slight tear on its tail and stiffened after being released. The *Hogna* sp. was collected and deposited as a voucher (ZUFRJ 0947). The identification of the spider to species level was not possible, as the copulatory bulb in the pedipalp, an important taxonomic character, was not completely developed, and the species is not a common one in the collecting area. The *D. pseudomeridianus* was also collected (ZUFRJ 14714). To our knowledge, this is the first record of predation upon a *D. pseudomeridianus* tadpole by a spider.

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***HYPSIBOAS ALBOPUNCTATUS* (Yellow-spotted Treefrog). PREDATION.** Herein, we report predation of *Hypsiboas albopunctatus* by the snake *Thamnodynastes hypoconia*. The observation took place at 2230 h on 13 February 2012 (air temperature 27.4°C), in a permanent lentic pond on the edge of a gallery forest in the rural zone of Aparecida do Rio Doce municipality, Goiás state, central Brazil (18.200194°S, 51.069167°W; datum SAD69). We heard alarm calls among shrubs and we observed a *T. hypoconia* capturing a *H. albopunctatus* by the posterior region of the body (Fig. 1). The treefrog stopped the alarm calls before we were able to record them. We continued the observation for 30 min. After predation, the snake continued its foraging activity and did not regurgitate. Specimens were not collected, but photographs were stored in the collections of the Universidade Federal de Goiás. This record reinforces the findings of Bellini et al. (2013. Herpetologica 69:67–79) that anuran amphibians are the main item of *T. hypoconia* diet, especially treefrogs of the family Hylidae. However, to our knowledge this is the first record of *T. hypoconia* feeding upon *H. albopunctatus*.

FIG. 1. Predation on *Hypsiboas albopunctatus* by *Thamnodynastes hypoconia*.

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***LEPTOBRACHIUM PULLUM* (Vietnam Spadefoot Toad). EYE COLORATION.** Eye color is often used to delineate frog species in the field and is generally recognized as a reliable taxonomic character (Glaw and Vences 1997. Herpetologia Bonnensis. SEH Proceedings, Bonn, pp. 125–138). This is particularly true of frogs in the genus *Leptobrachium* of the family Megophryidae, where external morphology is highly conserved across species, but eye color tends to vary interspecifically (Dubois and Ohler 1998. Dumerilia 4:1–32).

Leptobrachium pullum was first described as having the upper half of the iris colored scarlet in life (Smith 1921. Proc. Zool. Soc. London 1921:423–440), although more recent observations indicate that the scarlet coloration is restricted to a scleral arc under the palpebrum (Stuart et al. 2011. Zootaxa 2804:25–40). During multiple, extensive field surveys of the Ngoc Linh Nature Reserve, Kon Tum Province, Vietnam (15.08000°N, 107.92700°E;

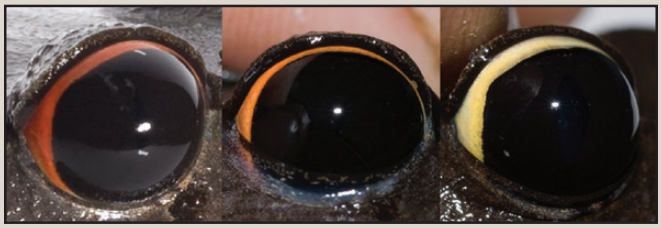

FIG. 1. Variation in sclera coloration in *Leptobrachium pullum* from Ngoc Linh Nature Reserve, Kon Tum Province, Vietnam.

datum WGS84), in 2009 and 2010, *L. pullum* were commonly observed, and photographs and notes were taken regarding eye coloration. While the location of coloration was shown to have little variation among individuals, sclera coloration was variable, ranging from scarlet to pale orange (Fig. 1) even among individuals located within meters of each other. Individuals displayed little other genetic, morphological, or acoustic differentiation (Rowley et al., unpubl. data). Scleral color did not appear to differ between diurnal and nocturnal observations. Nor was there an obvious correlation between sex and/or reproductive status.

Our observations highlight that although eye coloration is a very useful diagnostic character in the genus *Leptobrachium*, care should be taken to record variation within species. These findings may have taxonomic implications for future investigations within species of *Leptobrachium*.

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***LITHOBATES SPHENOCEPHALUS* (Southern Leopard Frog). PREDATION.** Adult Southern Leopard Frogs are preyed upon by a wide variety of vertebrates, including a number of bird species (Dodd 2013. Frogs of the United States and Canada.Vol. 1. John Hopkins University Press, Baltimore, Maryland. 460 pp.). The Barn Owl (*Tyto alba*) is the only documented nocturnal avian predator for Southern Leopard Frogs, however another owl species, the Great Horned Owl (*Bubo virginianus*), is known to predate the similar Northern Leopard Frog (*Lithobates pipiens*; Dodd 2013, *op. cit.*). At approximately 1400 h on 04 February 2014 while cleaning out Wood Duck (*Aix sponsa*) nest boxes on Big Lazer Public Fishing Area, Talbot Co., Georgia, USA (32.769199°N, 84.419635°W; datum WGS84), two of us (BG and JR) discovered a single Eastern Screech-owl (*Megascops asio*) in one of the boxes along with 21 Southern Leopard Frog carcasses, including one that was still in the talons of the sleeping owl (Fig. 1). Most of the frogs were fully intact, although a couple had been partially consumed. The box is in close proximity to the shallow headwaters of a 78-ha impoundment, where large numbers of Southern Leopard Frogs could be heard calling. There were no other prey items in the box, and the owl was alone with no signs of nesting. One other Eastern Screech-owl was found in a nest box closer to the dam (and well away from the frog chorus), but that box did not contain any frogs or other cached prey items.

FIG. 1. Eastern Screech Owl (*Megascops asio*) in nest box with cached carcasses of Southern Leopard Frogs (*Lithobates sphenocephalus*).

Eastern Screech-owls are known to cache large quantities of prey, especially in winter months when decay is slowed by cooler temperatures (Phelan 1977. Condor 79:127). Caching for the purpose of feeding young is also known, but no eggs or nestlings were observed and this observation was well before the known onset of nesting in this species (Gehlbach 1995. *In* Poole and Gill [eds.], The Birds of North America, pp. 1–24. American Ornithologists' Union, Washington, DC). Eastern Screech-owls have symmetrically positioned ears suggesting that vision often plays a greater role in prey location than does hearing, the latter of which is more commonly employed by owl species with asymmetrical ears (Gehlbach 1995, *op. cit.*). Thus, the Southern Leopard Frogs may have been encountered visually rather than by sound triangulation toward their vocalizations. Communal oviposition in shallow water by *L. sphenocephalus* is well known (see Trauth 1989. Proc. Arkansas Acad. Sci. 43:105–108) and makes large numbers of mating frogs quite susceptible to predation. To the best of our knowledge, this observation represents the first documented predation event on Southern Leopard Frogs by Eastern Screech-owls, and the only known caching event by this bird species involving only anurans.

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***LITHOBATES SYLVATICUS* (Wood Frog). EGG PREDATION.** Wood Frogs are abundant amphibians throughout much of northern and northeastern North America, and their eggs are known to be consumed by larval caddisflies (Rowe et al. 1994. J. Herpetol. 28:357–364), *Notophtalmus v. viridescens* (Eastern Red-Spotted Newts; Pitt et al. 2011. Herpetol. Rev. 42:263), larval ambystomatid salamanders (Redmer and Trauth 2005. *In* Lannoo et al. [eds.], Amphibian Declines: The Conservation Status of United States Species, pp. 590–593. Univ. California Press, Berkeley), and leeches (Cory and Manion 1953. Copeia 1953:66). To the best of my knowledge, larval fishflies (Megaloptera: Corydalidae: Chauliodinae) have not been documented as predators of the eggs of *L. sylvaticus* or any other amphibian. Fishflies produce large (up to 65 mm), predatory, aquatic larvae which (along with the larvae of some related megalopterans) are commonly called "hellgrammites" (Flint et al. 2008. *In* Merritt et al. [eds.], An Introduction to the Aquatic Insects of North America, pp. 425–426. Kendall/Hunt Publishing, Dubuque, Iowa).

I collected nine *L. sylvaticus* egg masses from a semi-permanent forest pond in Pennsylvania State Game Lands 176, Centre Co., Pennsylvania, USA (40.765°N, 78.016°W; datum WGS84) in April 2013 for use in a laboratory experiment. Upon return to the laboratory, I noticed that two egg masses had individual fishfly larva (*Chauliodes pectinicornis*) embedded within them. They could only be removed by separating the egg masses by hand. Each larval fishfly was transferred to a small plastic container. Because of how deeply embedded the fishflies were, I suspected they may have been feeding on the eggs. The smaller fishfly (approx. 20 mm) was therefore provided with three *L. sylvaticus* eggs and the larger fishfly (approx. 50 mm) was given nine eggs to test whether they would eat the eggs. After a week, the smaller fishfly was found dead and had not eaten any eggs. However, the larger fishfly had consumed the embryos of seven eggs, leaving the egg jelly relatively intact. I have previously observed *Chauliodes* sp. larvae in at least three other permanent or semi-permanent breeding ponds of *L. sylvaticus*. This is consistent with the long development time of these insect larvae, and many of those I observed were large enough that they had most likely overwintered in the ponds. Together, these observations suggest that fishfly larvae may be important egg predators for *L. sylvaticus* (and potentially other amphibians) in intermediate- to long-hydroperiod ponds.

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***LITHOBATES WARSZEWITSCHII* (Warszewisch's Frog). REPRODUCTIVE BEHAVIOR.** There are numerous reports of interspecific amplexus in anurans from many localities (Medina 2013. Herpetol. Rev. 41:123; Pearl et al. 2005. Am. Midl. Nat. 154:126–134; Ritchie et al. 2008. Herpetol. Rev. 39:80). *Smilisca phaeota* and *Lithobates warszewitschii* are common tropical frogs that can be found sympatrically from Honduras to Panama in lowland and premontane wet and moist forest. Here we report the first observation of amplexus between a native hylid and a native ranid in Panama and the first instance of this behavior between these species. At 2003 h on 20 Jan 2011, a male *L. warszewitschii* was observed in amplexus with an adult *S. phaeota* of undetermined sex in the roadside ditches at Río Luis, in the buffer zone of the Santa Fe National Park, Panama (8.68117°N, 81.217796°W; datum WGS84). Weather conditions were clear without rain and it had been two days since the last rain. The frogs were photographed and observed for six minutes. Two hours later, we returned to the same place and they remained in amplexus.

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***PHYLLOMEDUSA NORDESTINA* (Leaf Frog) and *PHYSALAEMUS CUVIERI* (Dwarf Frog). INTERSPECIFIC AMPLEXUS.** Interspecific amplexus occurs between amphibians overlapping spatially and temporally (Hobel 2005. Herpetol. Rev. 36:55–56; Hobel 2005. Herpetol. Rev. 36:439–440; Waterstrat et al. 2008. Herpetol. Rev. 39:458), and usually occurs between individuals of the same genus or family (Streicher et al. 2010. Herpetol. Rev. 41:208). On 12 March 2012 at 2000 h, on the banks of an artificial lake in Floresta Nacional do Araripe (Flona-Araripe), Barbalha Municipality, northeastern Brazil (7.36543°S, 39.44061°W; 912 m elev.), we observed interspecific amplexus between two individuals from different families when a female *Phyllomedusa nordestina* (Hylidae) was amplexed by a male *Physalaemus cuvieri* (Leiuperidae) (Fig. 1). Both individuals were trapped inside a tank ca. 1 × 3 m with an artificial depth of about 2.5 m. The tank had a water depth of 40 cm; the specimens were on a fallen log, outside of the water. Streicher et al. (2010, *op. cit.*) reported interspecific amplexus between the hylids *Smilisca baudinii* and *Pachymedusa dacnicolor* and members of this family are known to hybridize (Lamb et al. 1990. J. Evol. Biol. 3:295–309).

This study presents the first report of amplexus between the families Hylidae and Leiuperidae. A likely factor may have been stress due to competition for space associated with the reproductive activity of both species in the area. We thank CNPq who provided the scholarship for S. Ribeiro. The study was authorized by IBAMA permit number 29838-2. Field assistance was provided by O. Filho, G. Sousa, and A. Teixeira.

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PHOTO BY SAMUEL C. RIBEIRO

FIG. 1. Interspecific amplexus between *Physalaemus cuvieri* (male) and *Phyllomedusa nordestina* (female) from Floresta Nacional do Araripe, northeastern, Brazil.

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***PSEUDACRIS ILLINOENSIS* (Illinois Chorus Frog). PREDATION.** *Pseudacris illinoensis* is a fossorial anuran of conservation concern throughout its restricted geographic range. Predators of adults are unknown; confirmed predators of tadpoles include fishes and aquatic insects (Shepard et al. 2005. *In* Lannoo [ed.], Amphibian Declines: The Conservation of United States Species, pp. 484–485. University of California Press, Berkeley). Here, I report snake predation of a *P. illinoensis* tadpole. At 1130 h on 30 April 2013 (sunny, 23°C), I hand-captured a *Nerodia erythrogaster flavigaster* (SVL = 47 cm; total length = 66 cm) in a stagnant, shallow (< 25 cm deep), 1-m wide drainage ditch excavated in a cropfield in Alexander Co., Illinois, USA (precise location withheld). Upon handling, the snake regurgitated a *P. illinoensis* tadpole (total length = 4.1 cm). The tadpole was still alive, indicating recent consumption by the snake. I released the snake and tadpole into the ditch.

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***RHACOPHORUS RUFIPES* (Red-legged Tree Frog). MAXIMUM ELEVATION.** *Rhacophorus rufipes* is a small anuran (to SVL = 5.0 cm) endemic to the island of Borneo (Inger and Stuebing 2005. A Field Guide to the Frogs of Borneo. Natural History Publications, Kota Kinabalu. 201 pp.). The species dwells in primary forests in lowlands and hilly terrain (elev. up to 250 m), and congregate in low vegetation 1–3 m above the ground to breed (Inger 2005. The Systematics and Zoogeography of the Amphibia of Borneo. Natural History Publications, Kota Kinabalu. 402 pp.). Herein we report a new elevational limit for *R. rufipes*.

Between 1900–2200 h On 29 September 2008, a juvenile *R. rufipes* (SVL = 1.7 cm; mass = 0.5 g) was sampled via opportunistic examination at Sungai Lidan, Bundu Tuhan, Ranau District, West Coast Division, Sabah, Bornean Malaysia (5.9778°N, 116.5298°E, datum WGS84; elev. 1076 m). Air temperature was 18.4°C, and relative humidity was 80.6%. Sungai Lidan is a rocky-bottomed stream with clear and moderately flowing water. The river banks support much vegetation such as rattan, bamboo and wild ginger (Kueh et al. 2011. Herpetol. Rev. 42:91), and thus, provide preferred breeding habitats for *R. rufipes*. The finding represents an extension of elevational limit for *R. rufipes* to the submontane zone. The specimen (HEP00658) was deposited in BORNEENSIS, the Bornean reference collection of the Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah.

Elevational limit change in anurans could be attributed to climate change that enhances both the surrounding abiotic and biotic constraints mainly caused by increasing air temperature, and decreasing precipitation and moisture, and drives anurans uphill (Colwell et al. 2008. Science 322:258–261; Hargreaves et al. 2014. Am. Nat. 183:157–173). Uphill distribution of anurans narrows their geographical range, and subsequently, pushes anurans towards extinction (Toranza and Maneyro 2013. Phyllomedusa 12:97–106). Further studies on the natural history of anurans, in particular their elevational limit, geographical range, and autecology, becomes necessary for effective conservation endeavors.

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***RHINOPHRYNUS DORSALIS* (Mexican Burrowing Toad). PREDATION.** *Rhinophrynus dorsalis* ranges from southern Texas, USA and Michoacán, México, south along coastal areas to northeastern Honduras on Caribbean slope, and to Costa Rica in the Pacific slope (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.); in Costa Rica it is found exclusively in the northwest of the country (Savage 2002, *op. cit.*). At approximately 1750 h on 24 May 2013, at Santa Rosa National Park, Guanacaste Province, Costa Rica (10.83333°N, 85.61667°W; datum WGS84), near a flooded zone of the camping area, we observed a *Pulsatrix perspicillata* (Spectacled Owl) through 10x binoculars perched on a horizontal branch about 5 m high, with a *R. dorsalis* pressed down firmly under its left talon (Fig. 1). The toad was motionless, with its body inflated; from our point of view we were unable to see if it was injured, but the yellow spots on the back and very short limbs leave no doubt about species identification. The bird stayed around 15 min in this position, with its eyes almost closed in the first moments, making slow and gentle sideways movements with its head. Then the owl flew toward a nearby tall

FIG. 1. Predation of *Rhinophrynus dorsalis* (Mexican Burrowing Frog) by *Pulsatrix perspecillata* (Spectacled Owl) in Santa Rosa National Park, Guanacaste, Costa Rica.

tree with its prey in its claws, landing out of sight, preventing us from seeing if the owl consumed the toad. The diet of Spectacled Owls includes a wide range of prey sizes, from medium-sized mammals of several kilograms to birds, lizards, and large insects (Stiles and Skutch 2007. Guía de Aves de Costa Rica. INBio. 680 pp.; Voirin et al. 2009. Edentata 10:15–20). Until now an amphibian has never been reported as a diet item for this species of owl. To our knowledge, this is the first known predator on adults of the rare *R. dorsalis* (Dodd 2013. Frogs of the United States and Canada. Vol. 1. John Hopkins University Press, Baltimore, Maryland. 460 pp.).

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***SCAPHIOPUS HOLBROOKII* (Eastern Spadefoot). PREDATION.** Herein we document predation on *Scaphiopus holbrookii* by *Canis latrans* (Coyote), an opportunistic predator known to utilize an extensive array of prey (Grigione et al. 2011. Urban Ecol. 14:655–663; Leopold and Krausman 1986. J. Wildl. Manage. 50:290–295). We conducted necropsies of 201 Coyotes collected October 2011–March 2014 throughout Florida, USA. An 11.57 kg male's stomach collected on 03 June 2012 in southeast Columbia Co., Florida contained the remains of an adult male *S. holbrookii* and other items. This is the first report of predation by the Coyote on *S. holbrookii*, although it is has been reported preying on *Spea intermontana* (Great Basin Spadefoot; Dodd 2013. Frogs of the United States and Canada. Vol. 2. John Hopkins University Press, Baltimore, Maryland. 982 pp.). Opportunistic predation of an explosive breeding species is indicative of a generalist predator.

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***SMILISCA DENTATA* (Upland Burrowing Tree Frog). PREDATION.** *Smilisca dentata* is a medium-sized tree frog that lives in burrows. It is endemic to Central México, between southern Aguascalientes and extreme northwestern Jalisco. It is listed by IUCN as Endangered and by Norma Oficial Mexicana as threatened. In recent years, knowledge about *S. dentata* has increased, including information about its distribution, population dynamics, abundance, reproduction, growth, and diet. There are no reports of predators, including any avian predators (Quintero-Díaz and Vázquez-Díaz 2009. Historia Natural de una Rana muy Mexicana. Sociedad Herpetológica Mexicana, Ayuntamiento de Aguascalientes y SEMARNAT. 169 pp.). Here, we report evidence of predation on *S. dentata* by the bird *Lanius ludovicianus* (Loggerhead Shrike), which preys on a wide variety of vertebrates including amphibians, mainly frogs (Lefranc 1997. Shrikes. A Guide to the Shrikes of the World. Yale University Press, New Haven and London. 192 pp.). At 0158 h on 12 November 2009, at Buenavista de Peñuelas, Aguascalientes, México (21.725166°N, 102.300977°W, datum WGS84; elev. 1872 m), we found a dead juvenile *S. dentata* (SVL = 30 mm; UAA-CV-AN229) impaled on barbed wire by *L. ludovicianus* (Fig. 1). We did not observe the bird capturing or killing the frog but we assume it was the result of shrike predation because this behavior is characteristic of the species. To our knowledge, this is the first record of predation on *S. dentata* by *L. ludovicianus*.

FIG. 1. Juvenile Upland Burrowing Tree Frog (*Smilisca dentata*) impaled on barbed wire by a Loggerhead Shrike (*Lanius ludovicianus*), at Buenavista de Peñuelas, Aguascalientes, México.

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TESTUDINES — TURTLES

***CARETTA CARETTA* (Loggerhead Sea Turtle). PREDATION.** Coyotes (*Canis latrans*) are generalist predators known to opportunistically utilize an extensive array of species (Leopold and Krausman 1986. J. Wildl. Manage. 50:290–295; Grigione et al. 2011. Urban Ecol. 14:655–663) and are reported to be a nest predator of *Caretta caretta* (Kurz et al. 2012. Oryx 46:223). Herein we provide the first definitive observation of predation on *C. caretta* hatchlings by a Coyote. We conducted necropsies of 201 Coyotes collected October 2011–March 2014 throughout Florida, USA. Twenty-six of the Coyote carcasses were collected from coastal areas during the marine turtle nesting season. The stomach of a 14.1 kg male collected on 26 June 2013 from Archie Carr National Wildlife Refuge, Indian River Co. (27.7953°N, 80.4137°W; datum WGS 84), contained the remains of three *C. caretta* hatchlings (Fig. 1).

FIG. 1. *Caretta caretta* hatchlings found in the stomach of an adult male *Canis latrans*.

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***CHELYDRA SERPENTINA* (Snapping Turtle). WINTER DROUGHT REFUGIA.** *Chelydra serpentina* inhabits many freshwater habitats including wetlands, rivers, lakes, and ponds (Ernst et al. 1994. Turtles of the United States and Canada. Smithsonian Institution, Washington D.C. 578 pp.) and has been reported to overwinter in shallow water in lakes and streams and muddy marshes in the northern portion of their range (Meeks and Ultsch 1990. Copeia 1990:880–884; Brown and Brooks 1994. Copeia 1994:222–226). Most reports on *C. serpentina* overwintering are from Canada and the northern USA, and there is little published information on the overwintering habits of this species in the southern portion of its range. The following observations were made at the Joseph W. Jones Ecological Research Center at Ichauway in Baker Co., Georgia, USA.

On 27 January 2012, we captured a hatchling *C. serpentina* (CL = 23.8 mm) swimming in a deep muddy pool within a dry, isolated cypress-gum (*Taxodium ascendens* and *Nyssa sylvatica*) wetland that was located approximately 1.5 km from the nearest permanent open water source. The pool was surrounded by Buttonbush (*Cephalanthus occidentalis*) (Fig. 1), and was located within several meters of an American Alligator (*Alligator mississippiensis*) burrow. We investigated the area further when we noticed bubbles emerging from the mud and excavated two more Snapping Turtles, an adult male (CL = 228 mm) and adult female (CL = 320 mm) (Fig. 2), which were buried one on top of the other >30 cm underneath the mud. Both turtles were marked by notching marginal scutes (Cagle 1939. Copeia 3:170–173) and released that same day. We revisited the site on 2 February 2012 and captured two more unmarked adults, both males (CL = 297 and 389 mm, respectively). Thus we observed a total of five different individuals using this single muddy pool in a wetland that had been dry for the previous 12 months. We revisited the wetland again

FIG. 1. Deep muddy pool in dry cypress gum wetland where multiple *Chelydra serpentina* were found overwintering in January-February 2012 and 2013.

FIG. 2. Adult female *Chelydra serpentina* immediately after being excavated from a deep muddy pool on 27 January 2012.

nearly a year later on 14 December 2012 and captured two adult turtles in the original muddy pool, one of which was a marked male that had been captured the previous winter. We searched for other depressions within the wetland on 21 December 2012 and captured a marked female that had moved from the previous area to a different muddy spot under the roots of a pond cypress. At this point the wetland had been dry for 11 months. We investigated another dry cypress gum swamp 7 km N of the original wetland on 16 January 2013, and found an adult male *C. serpentina* (CL = 316 mm) buried under mud in a low area of the wetland near an *A. mississippiensis* burrow. We placed a radio transmitter on this individual and found that he remained in the same spot until 5 February 2013, when the wetland began to fill due to rainfall and the turtle moved to a different area in the wetland. It is unknown whether these low muddy areas were naturally occurring, or whether they were dug or modified by *C. serpentina*.

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***CHRYSEMYS PICTA BELLI* (Western Painted Turtle). PREDATION.** Temperate aquatic turtles lay eggs in early summer, which hatch 2–3 months later. Rather than departing natal nests in late summer, hatchlings of many species brumate within these nests and emerge the following spring (Costanzo et al. 2008. J. Exp. Zool. 309A:297–379; Gibbons 2013. J. Herpetol. 47[2]:203–214). From oviposition to initiation of the aquatic phase of their life

history, two periods of heavy predation occur. Many eggs are depredated shortly after nest construction, with the risk decreasing over time (i.e., fresh nests are most vulnerable). Second, many hatchlings are depredated during migration from their terrestrial nests to aquatic habitats. A putative advantage of nest brumation by hatchling turtles is avoidance of potentially heavier predation during fall migration compared to spring migration. Over the winter, mortality from abiotic conditions (e.g., extreme cold) may occur in nests, but mortality from predation has apparently not been previously documented. Here we report apparent predation of hatchling *Chrysemys picta* from natural nests during winter.

As a part of our research on nesting ecology of *C. picta*, we had mapped the location of 16 intact nests near Thomson, Illinois, USA (41.9480°N, 90.1163°W, datum WGS 84; elev. 179 m). These nests were targeted for use in a study examining the influence of nest temperature during winter on hatchling mortality. On 3 November 2013, we carefully removed the soil covering these nests, counted the live hatchlings within each nest, and subsequently reburied these nests. We returned on 30 March 2014 to retrieve hatchlings. Of the 16 nests, 13 had no hatchlings. We infer that nests were depredated (rather than experiencing early emergence by hatchlings) for two reasons. First, soil was nearly frozen in November and still frozen in March, suggesting that hatchlings would have been physically unable to emerge during that period (due to low body temperature and frozen soil). Second, the soil plug that typically covers the opening to each flask-shaped nest was gone and the cavity was void of excess soil. When hatchlings emerge, much of that soil from the plug falls into the nest cavity and the cavity is usually partially filled in with loose soil and eggshell fragments. Instead, these "cleaned out" cavities appeared similar to nests that are depredated by mammals shortly after oviposition in spring and early summer.

Potential predators that are common at our site and active during this winter period include squirrels (*Sciurus carolinensis*), raccoons (*Procyon lotor*), opossums (*Didelphis virginiana*), and mustelids (*Neovision vision, Lontra canadensis*). It was a necessary component of our study to un-cover and re-cover nests in November. Consequently, it is impossible for us to determine whether this disturbance enhanced predator detection of the nests. However, we carefully re-covered nests with soil and leaf litter to minimize visual disturbance, which is the primary cue used by predators during nesting season at our site (Strickland et al. 2010. J. Herpetol. 44:467–470). Additionally, in seven other years of this study using identical methods, we never observed predation at this stage. Our novel predation observation indicates another potential mortality source for hatchling turtles during brumation, a critical early life stage, and challenges a previous assumption regarding the adaptive significance of this neonatal brumation behavior.

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***GOPHERUS MORAFKAI* (Sonoran Desert Tortoise). DRINKING BEHAVIOR.** Water-balance in desert tortoises (*Gopherus* spp.) of the arid Southwest USA has received considerable attention since it was first documented that they will drink free-standing water (Medica et al. 1980. Herpetologica 36:301–304). The tortoises often void bladder contents while being examined for morphological measurements or attachment of radio transmitters (30–60% of tortoises handled; see below), and there is evidence that this loss can have negative fitness consequences (Averrill-Murray 2002. Chelon. Conserv. Biol. 4:430–435). Observations on drinking behavior under natural and artificial (i.e., opportunities provided by humankind) may thus be significant. We initiated a radio-tracking study of Sonoran Desert Tortoises in 2011, and have observed natural and artificially induced drinking behavior in free-ranging subjects that voided bladder contents during processing (Sullivan et al. 2014. Chelon. Conserv.Biol. 17 [*in press*]). Here, we report drinking behavior associated with elimination of urate materials over a very short time period.

FIG. 1. Juvenile *Gopherus morafkai* drinking from container (~ 250 ml) at 0857 h (left), immediately prior to voiding urates (right; note pinkish material immediately posterior to tortoise, surrounding by fluid stained soil) at exactly 0902 h.

FIG. 2. Adult *Gopherus morafkai* drinking from catchment at waterfall following brief rainstorm; note that though the mouth remained closed, the head was completely submerged.

In the summer of 2012, we initially captured and tagged (with radio transmitter) a juvenile tortoise (160 mm straight-line carapace length at first capture) that subsequently (Fall 2013) moved almost 1 km to occupy a dike structure maintained by the Maricopa County (Arizona) Flood Control District (MCFCD). In early March 2014, it was relocated to the eastern slope of the Union Hills, exactly four weeks prior to the observations reported herein, as a result of requests by MCFCD personnel (maintenance of the dike required application of herbicides and associated use of heavy construction equipment). When the tortoise was moved, it voided (estimated as approximately 25–50 ml of fluid), and we were concerned that this individual might be compromised.

Thus, when we released the tortoise, we provided an opportunity for drinking by filling a series of rocky catchments at its release site, a small wash with many recently used tortoise refuges nearby, but we observed that it bypassed the artificial pools, and entered a caliche formation refuge without taking any water. Consequently, in the absence of rainfall, each subsequent tracking event was approached as an opportunity to rehydrate the subject (e.g., if found within a refuge, it was deemed unavailable for watering, etc.). On 20 April we located the individual in shade, in a relatively flat area in which we could place a small, round container of water (125 mm diameter, 20 mm deep), immediately anterior to the tortoise, in the hope it would drink despite the artificial nature of the situation.

The container was initially placed at 0840 h (air temp = 22°C) in the shade of large (2 m height) Palo Verde along a small wash on the eastern slopes of the Union Hills (33.72909°N; 112.05661°W, datum NAD27; elev. 527 m) in Maricopa Co., Arizona. Initially, the tortoise withdrew but one of us remained crouched ~ 1 m away so that we could provide additional water and reposition the container (which was tipped over twice by the subject and repositioned each time immediately to its front). On the third placement, after 15 min had elapsed, the tortoise allowed its head to be sprinkled with water as the container was refilled for the third time, and this seemed to finally stimulate a drinking response. The individual lowered its head into the water, tilting it at an almost 90° angle to the ground, and began to drink (Fig. 1), apparently through the nares. As with naturally observed drinking events (Fig. 2), the tortoise submerged the nares and mouth and did not open the mouth significantly; the throat region pulsed regularly during the entire process, once every few seconds. It consumed the entire contents, measured as ~ 200 ml, in 5 min and 11 sec, and then voided a dark, tea stained liquid (estimated as ~ 100 ml based on comparative estimates of water required to moisten a similar sized patch of nearby soil), and a viscous paste of pinkish urates (Fig. 1). The urates were passed immediately upon cessation of drinking, as it lifted its head from the water container, just over 5 min since the initiation of drinking.

Our observations suggest that researchers, if persistent, can achieve re-hydration of subjects that have voided during processing, and presumably mitigate increased mortality effects documented by Averrill-Murray (*op. cit*). In addition, our observations reveal that hydration allows for extremely rapid "flushing" of urate materials and a presumed reduction of any negative physiological consequences of their retention.

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GOPHERUS POLYPHEMUS **(Gopher Tortoise). PREDATION.** Known ophidian predators of *Gopherus polyphemus* eggs and hatchlings include: *Agkistrodon piscivorus*, *Crotalus adamanteus*, *Coluber flagellum*, and *Drymarchon corais* (Ernst and Lovich 2009. Turtles of the United States and Canada, 2nd ed., The Johns Hopkins University Press, Baltimore, Maryland. 827 pp). Additionally, Douglas and Winegarner (1977. J. Herpetol. 11:236–238) state, "Carr (1963) implied the pine snake, *Pituophis melanoleucus*, as a potential predator of the young [*G. polyphemus*] in Florida"; however, upon reviewing Carr 1963 (The Reptiles. Times Inc., New York. 192 pp.) we found no such implication. Herein we report a novel predator of *G. polyphemus* eggs.

On 16 July 2013 at 1210 h an adult female *P. m. lodingi* (SVL = 143.1 cm; tail length = 17.8 cm, 1030 g) was observed crossing a dirt road in the southwestern corner of the Camp Shelby Joint Forces Training Center, De Soto National Forest, Perry Co., Mississippi, USA. While processing the snake it was noted that she was a recapture (original capture date: 9 September 2004, estimated age and SVL at first capture 4 y.o. and 121.1 cm; respectively), overtly gravid, and the decision was made to retain the animal in captivity until oviposition (which took place 6 d later; clutch size = 5 eggs). On 12 September 2013 the snake defecated in the terrarium that she was temporarily housed in, and while examining the scat contents, the inner shell membrane of a *G. polyphemus* egg was found (pieces of the outer shell membrane were present where the egg had been folded over during ingestion/ digestion). To the best of our knowledge this is the first instance of a *G. polyphemus* in the diet of *P. melanoleucus*.

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GRAPTEMYS OUACHITENSIS **(Ouachita Map Turtle). INTERACTION WITH PREDATOR.** The risk of Raccoon (*Procyon lotor*) predation encountered by many North American freshwater turtles during terrestrial nesting forays (reviewed in Ernst and Lovich 2009. Turtles of the United States and Canada. Johns Hopkins University Press, Baltimore, Maryland. 840 pp.) has been suggested to have played a role in nesting schedules (e.g., sensu Congdon et al. 1983. Herpetologica 39:417–429), with larger turtle species that possess sufficient defense mechanisms (e.g., *Chelydra serpentina*, *Emydoidea blandingii*) having a wider temporal overlap with the largely crepuscular or nocturnal raccoons than smaller, diurnally nesting forms (e.g., *Chrysemys picta*). However, it is also understood that mammalian predation risks on adult turtles are but one of several factors that shape reproductive activity patterns (e.g., Bowen et al. 2005. J. Zool., London 267:397–404), including desiccation and temperature-related physiological constraints, and diurnal avian predation risks on turtle eggs and possibly adults of smaller species. The ultimate behavioral pattern that emerges for each species may thus reflect a complex balance of sometimes opposing selection pressures, making interpretations difficult (e.g., the nocturnal nesting of *Clemmys guttata*, one of the smallest of North American emydids and presumably one of the most vulnerable species to nocturnal mammalian predators (Litzgus and Brooks 1998. J. Herpetol. 32:252–259).

It has been suggested that the intensity of Raccoon predation on adult turtles may be skewed toward smaller individuals in some populations (e.g., West-central Illinois *Trachemys scripta*, Tucker and Janzen 1999. Am. Midl. Nat. 141:198–203). However, turtle size did not appear to influence predation likelihood for the large emydid, *Pseudemys concinna suwanniensis*, predated by the small–medium sized Raccoon races of northern Florida (Jackson and Walker 1997. Bull. Florida Mus. Nat. Hist. Biol. Sci. 41:69–167). Raccoon predation risks on nesting female turtles are also likely to be context dependent, differing in intensity with, among others factors, geographic location, meteorological effects on turtle and predator activity schedules, and time spent nesting, size of nesting areas and location within the surrounding land matrix, and local raccoon densities and behavior.

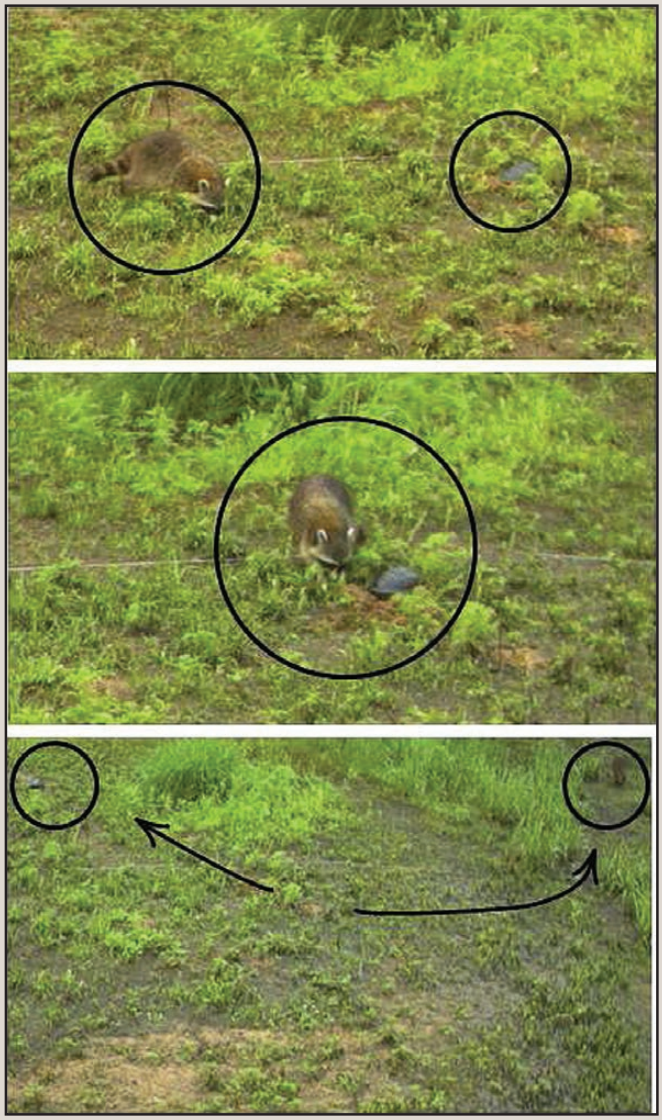

FIG. 1. Images one minute pre-encounter (top), encounter (middle) and one minute post-encounter (bottom) of nesting Ouachita Map Turtle (*Graptemys ouachitensis*) and Raccoon (*Procyon lotor*) interaction; 1940–1942 h, 15 June 2013, Iowa County, Wisconsin, USA.

This note reports observations of diurnally active Raccoons in camera-documented proximity to female Ouachita Map Turtles (*Graptemys ouachitensis*)—without evidence of turtle predation—during June 2013 at a Wisconsin River nesting site in Iowa County, Wisconsin, USA (described as Site A in Geller [2012. Chel. Conserv. Biol. 11:206–213]). Images were obtained using digital trail cameras (1 Reconyx HC600 HyperFire™ programmed to take time-lapse images at 1-min intervals and motion-triggered series; 3 Reconyx Silent Image™ RM30, with 5-min time-lapse intervals and motion-triggered series).

In an encounter on 15 June 2013 (1940–1942 h), a Raccoon detected a turtle approximately 16 minutes after beginning nest construction and possibly just prior to egg deposition, spent < 2 minutes near the nesting turtle, causing nest abandonment, and then both the Raccoon and the turtle departed the field-of-view on separate trajectories (Fig. 1). In Fig. 1 (middle), the raccoon is rearward of the nesting turtle and apparently focused on the ground, indicating an interest in turtle eggs rather than the turtle itself. In other instances, individual Raccoons were either present in the same camera field-of-view with transient turtles (15 June 2013) or within a few minutes of other nesting turtles (16 and 22 June 2013) without camera or subsequent field evidence (e.g., predated turtles near monitored areas) of physical interaction.

The influence of year-to-year variation in Raccoon activity schedules on the likelihood of turtle interaction was demonstrated at this site by the dramatic increase in diurnal Raccoon presence during the 2013 nesting season relative to previous years (31 vs. 2008–2011 mean of 2.25 raccoons, respectively, during 0600–1900 h; raccoon images separated by ≥ 30 min regarded as separate occurrences). The high visitation rates by nest foraging Raccoons and associated short nest survival times at this well-used nesting site (Geller 2012. Chel. Conserv. Biol. 11:197–205) suggest that turtle eggs deposited in this area are a known, dependable food resource to the local Raccoon population. While Raccoon predation on adult *Graptemys* has been reported elsewhere (Lindeman 2013. The Map Turtle and Sawback Atlas: Ecology, Evolution, Distribution, and Conservation. Univ. Oklahoma Press, Norman. 460 pp.), the lack of observed predation on adult turtles noted here may reflect the presence of this protein-rich resource in meeting Raccoon caloric demands (at least for diurnally foraging individuals with the potential to appropriate relatively high proportions of nests), and/or a potentially higher cost/benefit ratio of predating these medium-sized map turtles (females 163–242 mm straight line carapace length [Vogt 1980. Tulane Stud. Zool. Bot. 22:17–48]) relative to excavating and consuming eggs.

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***PHRYNOPS TUBEROSUS* (Peters' Side-necked Turtle). HATCHLING SIZE.** *Phrynops tuberosus* is a medium-sized (to 30 cm carapace length) chelid turtle found in Guyana, the southeastern portion of Venezuela, Suriname, French Guyana, the eastern Amazon basin, and northeastern Brazil (Ernst and Barbour 1989. Turtles of the World. Smithsonian Inst. Press, Washington, DC. 313 pp.; Bonin et al. 2006. Turtles of the World. Johns Hopkins University Press, Baltimore, Maryland. 416 pp.). This species is used for food and medicinal purposes by humans (Alves et al. 2012. J. Ethnobiol. Ethnomed. 8:1–29), but much of its natural history remains poorly known. Here we report the first morphometric data for hatchling *P. tuberosus*.

On 20 November 2013, during faunal rescue operations resulting from the Project of Integration of São Francisco River (PISF), we collected three turtle eggs, hitherto of unknown species. The eggs were located in an area that will be the site of a dam of the Morros Reservoir (7.14726°S, 38.59988°W), in the municipality of São José de Piranhas, state of Paraíba, Brazil. The collection site was a small area with an accumulation of water (approximately 5 m long × 2 m wide), which was already drying, where a tractor was clearing low vegetation that had formed a dense cover over the ground. Of the three eggs collected, two remained intact and were placed in a folded tissue, which was wrapped in a plastic bag sealed with adhesive tape, and taken to the hotel hosting the rescue team. In this condition the eggs were kept at ambient temperature and humidity. On 23 November 2013 two hatchlings were found (Fig. 1) between the tissue and plastic bag. They were taken to the Laboratório de Morfofisiologia of the Núcleo de Ecologia Molecular (NECMOL) in the Centro de Conservação e Manejo de Fauna da Caatinga (CEMAFAUNA-CAATINGA)

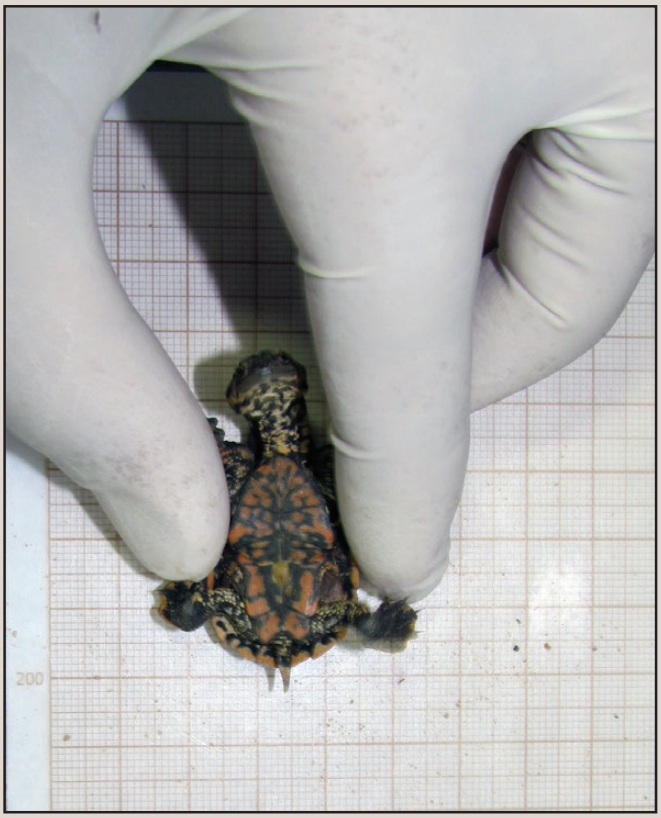

FIG. 1. Plastron view of hatchling *Phrynops tuberosus* (carapace length: 31.9 mm, plastron length: 24.9 mm).

where they were identified (Ernst and Barbour, *op. cit.*; Bonin et al., *op. cit.*), and measured using a digital caliper (precision = 0.01 mm); body mass was measured with a precision balance (1 g).

Morphometric data for the two hatchlings follows: carapace length (CL of turtle 1: 31.9 mm, CL of turtle 2: 30.3 mm), carapace width (CW1: 22.8 mm, CW2: 19.7 mm), shell height (SH1: 10.5 mm, SH2: 9.8 mm), plastron length (PL1: 24.9 mm, PL2: 23.8 mm), plastron width (PW1: 15.4 mm, PW2: 13.8 mm), body mass (BM1: 4.3 g, BM2: 3.9 g). In comparison, Ferreira Júnior et al. (2011. Zoologia 28:571–576) reported the weight and size for 83 hatchlings of the closely related *P. geoffroanus*, hatched in natural nests on sandy beaches along the Upper Xingu River in the Brazilian Amazon Basin: mean carapace length (38.3 ± 2 mm; range = 31.5–41.3), carapace width (30.1 ± 1.83 mm; range = 24.7–33.6), height of shell (13.9 ± 1.06 mm; range = 11.3–16.1), and mean hatchling mass (9.1 ± 1.4 g; range = 6–11.5).

The specimens of *P. tuberosus* (MFCH 3352–3353) were deposited in the Herpetological Collection of the Centro de Conservação e Manejo de Fauna da Caatinga (CEMAFAUNA-Caatinga/UNIVASF), Petrolina, Pernambuco, Brazil. We thank the Ministério da Integração Nacional for financial support. IBAMA provided the collecting permit (# 95/2012 Process n° 02001.003718/94-54).

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***PODOCNEMIS SEXTUBERCULATA* (Six-tubercled Amazon River Turtle). MOVEMENT.** *Podocnemis sextuberculata* is a small Amazonian freshwater turtle found in Colombia, Brazil, and Peru (Vogt 2008. Amazon Turtles. Biblos, Lima, Peru. 104 pp.). This species has a dynamic movement pattern influenced by the variable hydrological regime of its habitat (Fachin-Terán et al. 2006. Chelon. Conserv. Biol. 5[1]:18–24). During the high water season, individuals remain in lakes and flooded forest. As water levels begin to fall, turtles move into the main river channel, where adult males and females concentrate in deep pools near the nesting beaches (Fachin-Terán et al. 2006, *op. cit.*; Vogt 2008, *op. cit.*). As the water level again starts to rise after the nesting season, the turtles return to the lakes and flooded forest.

Since 2006, RCV and collaborators have been systematically monitoring the population structure and movement patterns of freshwater turtles in the Trombetas River Biological Reserve (1.25°S, 56.83°W; WGS84), a reserve maintained by the Brazilian government in Oriximiná, Pará State, Brazil. According to monitoring results, the *P. sextuberculata* female recapture rate is low and the sex ratio is always male-biased. To understand these results, we conducted a radio telemetry study to investigate the post-nesting behavior of female *P. sextuberculata*.

The field study was conducted from September to December, in 2010, 2011, and 2012. This is the dry season in the Trombetas River region, when the water level is lowest and females are easily captured on the nesting beaches or in nearby deep pools along the main river channel. We captured eleven *P. sextuberculata* post-nesting females by hand or using trammel nets; for each we attached a radio transmitter (AVM Instrument Company, California, USA; MP2 Model) on 5th central carapace scute with Turbolit, an epoxy based product. The 164–165 MHz transmitters had a programmed battery life of one to two years. Movements based on radio telemetry were summarized for each individual and all the distances were measured in a straight line from release point to transmitter location point. The females had a mean straight-line carapace length of 289.63 mm (N = 11; SD = 9.83; 286–318 mm) and mean mass of 2805 g, SD = 292 (2150–3200 g).

In 2010, 2011, and 2012 field seasons, five, two, and four females, respectively, were monitored using radio telemetry. In 2010, four turtles were located 98 times, up to ten days after release. After this period we lost the signals. In 2011, one turtle was located three times during six days (last location: 5 October 2011) and the other was located five times during ten days (last location: 8 October 2011). On 22 November 2012 both of the females from 2011 as well as the four marked in 2012 were located in the Pracuuba Stream, a tributary of Erepecu Lake, at a water depth of 1.06–2.54 m (Fig. 1). This area is 10 km in straight line distance from the last location noted in 2011, but these turtles move via water, so the actual distance is about 60 km, following the most direct route within the lake and river channels (Fig. 2).

Females with radio transmitters attached in 2012 were located 29 times during 3 months. One turtle was released on 26 September 2012 and monitored for 12 days until 7 October 2012. Forty-five days later, on 22 November 2012, this turtle was found 10 km away from the last location in the Paracuuba Stream together with the other three marked in 2012 and the two from 2011. All were found in the same small area, where they were probably feeding on mollusks. Notably, we found two of the 2012 females back at

FIG. 1. Pracuuba Stream, a tributary of Erepecu Lake, at a water depth of 1.06–2.54 m, both of the females from 2011 as well as the four marked in 2012 were located here on 22 November 2012.

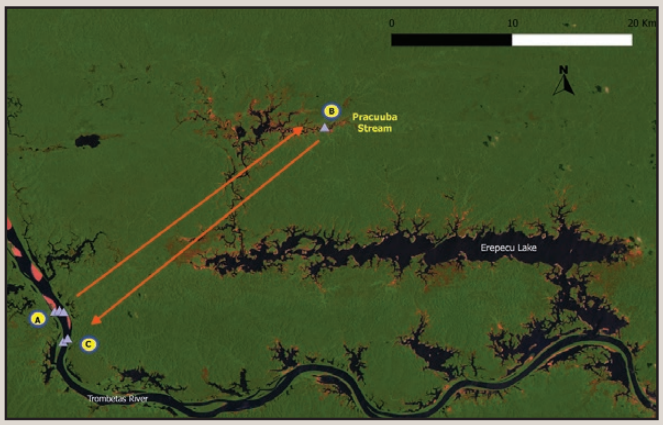

FIG. 2. Satellite image of movement patterns of the *Podocnemis sextuberculata* females from the nesting beach to Pracuuba Stream in Erepecu Lake.

the nesting beaches on 6 December 2012 in the Trombetas River where they were originally marked during the nesting season. This involved a displacement of 60 km upstream against the current in 12 days or less. Nesting had terminated in October, and these females had returned to the nesting beach at the time their eggs were due to hatch. Behavioral interactions and audible communications between adults and hatchlings have recently been described for the Giant South American River Turtle (*Podocnemis expansa*). It is now thought that adults of this species wait off the nesting beaches for their hatchlings to emerge and then migrate downstream with them (Ferrara et. al. 2014. Herpetologica, *in press*). Thus, the possibility of group social behavior must also be studied in *P. sextuberculata*.

Gathering movement data and understanding the detailed patterns of turtle movements are necessary for recommending management or conservation programs for them. Nesting beach requirements are well known, but this new data on home range, which is apparently nearly as great as that of the larger *P. expansa*, is a notable discovery. We lost track of the females marked in 2011 and 2012 because they had ranged much farther than predicted, and into a habitat that they previously were not known to use. Our data show that post-nesting *P. sextuberculata* females migrate to particular feeding areas and that at least some of them return to the nesting beaches at the time the hatchlings are emerging. Describing the social behavior in this species, including the possibility of vocal communication, will warrant further research.

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***RHINOCLEMMYS AREOLATA* (Furrowed Wood Turtle). MAXIMUM SIZE AND MASS.** The maximum size previously reported for *Rhinoclemmys areolata* is a straight-line carapace length of 20.7 cm, obtained from an intact shell of a gravid female found in Belize (Platt et al. 2004. Herpetol. Rev. 35:383). The maximum body mass reported for the species seems to be also from a female from Belize weighting 930 g (Vogt et al. 2009. Chelon. Res. Monogr. 5:022.1–022.7).

On 19 February 2014, during turtle sampling at Pochote (17.76236°N 91.73963°W, datum WGS84; elev. < 10 m), Emiliano Zapata Municipality, State of Tabasco, México, we measured a captive female *R. areolata* with a carapace length of 24.0 cm and a body mass of 1550 g. Other parameters measured were the plastron length (22.7 cm), carapace high (84.33 mm), carapace maximum width (15.8 cm), and head width (30.7 mm). The owners of the turtle told us that the specimen was collected between the Chaschoc lagoon and Nuevo Pochote, about 8 km N of this locality. On 5 March 2014, we measured another captive female of *R. areolata* at the locality of La Isla (17.75756°N, 91.73421°W, datum WGS84; elev. < 10 m) in the same municipality, which surpassed the maximum size given by Platt et al. (2004, *op. cit.*). The individual had a carapace length of 21.1 cm and a mass of 1440 g. The other parameters were plastron length (19.3 cm), carapace high (63.31 mm), carapace maximum width (15.1 cm), and head width (26.0 mm). These females and other individuals of *R. areolata* are kept as pets by local people, and this seems to be the principal use of this species by humans in the region.

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***SIEBENROCKIELLA LEYTENSIS* (Philippine Forest Turtle). DIET.** *Siebenrockiella leytensis* is an endemic geoemydid

FIG. 1. *Siebenrockiella leytensis* fecal pellets with snail shell fragments (EYS 266; square = 5 mm).

FIG. 2. *Siebenrockiella leytensis* fecal pellets with rice grains (EYS 265; square = 5 mm).

turtle from Palawan and Dumaran Island, Philippines. Its diet is known to consist of fish, shrimp (genus *Macrobrachium*), crabs, snails (*Pomacea canaliculata* and family Thiaridae), algae, and fruits (genus *Ficus*) (Diesmos et al 2012. Chelon. Res. Monogr. 5:066.1–9; Diesmos et al 2008. Chelon. Conserv. Biol. 7:157–177). Here we report on additional food items in the diet of this turtle.

While conducting wildlife trade research in a Metro Manila pet center, EYS collected seven fecal pellets between 28 November 2012 and 17 December 2012 from multiple wild-caught *S. leytensis* (SCL 71–193 mm; gender undetermined; N = 30). Snail shell fragments were identified as *Pomacea canaliculata* (an invasive species in the Philippines), *Melanoides* sp. (family Thiaridae) and *Planorbis brunneus* (family Planorbidae) (Fig. 1). Six out of seven fecal pellets also contained rice grains (*Oryza sativa*) (Fig. 2). To our knowledge, this is the first report of rice in the diet of a Philippine turtle.

Voucher specimens were preserved in 70% ethanol and deposited in the herpetological collection of the Philippine National Museum (EYS 263–265, and EYS 267) and malacological collection of the University of the Philippines, Diliman (EYS 262, EYS 266, and EYS 271).

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CROCODYLIA — CROCODILIANS

***ALLIGATOR MISSISSIPPIENSIS* (American Alligator). CANNIBALISM.** Cannibalism, broadly defined as the consumption of conspecifics through predation or scavenging (Fox 1975. Annu. Rev. Ecol. System. 6:87–106; Polis and Myer 1985. J. Herpetol. 19:99–107), has been reported to occur in several species of crocodilians (Pitman 1941. Uganda J. 9:89–114; Polis and Myer, op. cit. and references therein; Messel and Vorlicek 1986. Austral. Wildl. Res. 13:71–111; Richards and Wasilewski 2003. Herpetol. Rev. 34:371; Somaweera et al. 2013. Herpetol. Monogr. 27:23–51), including *Alligator mississippiensis* (Giles and Childs 1949. J. Wildl. Manage. 13:16–28; Rootes and Chabreck 1993. Herpetologica 49:99–107; Delany et al. 2011. Herpetologica 67:174–185). Cannibalism among crocodilians remains poorly understood, but suggested causes include food availability, population density, demographic factors, and habitat characteristics (Rootes and Chabreck, *op. cit.*; Delany et al., *op. cit.*). Cannibalism among crocodilians may regulate population size and serve as an important energy loop (Polis 1981. Annu. Rev. Ecol. System. 12:225–251; Rootes and Chabreck, *op. cit.*; Delany et al., *op. cit.*). Here we report three field observations of apparent cannibalism among wild *A. mississippiensis* from two locations in Louisiana, USA.

The first observation was made during July 1983 on Rockefeller Wildlife Refuge (Cameron Parish, Louisiana, USA) when RME found the carcass of a small alligator (total length [TL] approximately 1.3 m) floating in a drainage ditch adjacent to an active alligator nest. When a coworker attempted to retrieve the carcass with a noose pole, the nesting female alligator (TL ca. 2.1 m) swam rapidly across the ditch from the nest site, seized the carcass at the base of the tail, and swam back to the nest. Once at the nest, the female climbed up the bank dragging the carcass partially out of the water. The nesting female was identified by a series of marked caudal scutes as an escapee from a captive breeding enclosure on the refuge. Based on the behavior of the nesting female, we assume she was responsible for the death of the smaller alligator. Because female alligators actively defend nests against potential predators (Hunt and Ogden 1991. J. Herpetol. 25:448–453), the heightened aggressiveness of the attending female may have played a role in this incident. The ultimate fate of the alligator carcass could not be determined, but we suspect the female may have cached it nearby (Doody 2009. Herpetol. Rev. 40:26–29).

The second observation occurred on 24 June 2013 (1319 h) when PLT and a co-worker were flying in a helicopter at an altitude ≤ 46 m marking alligator nests as part of an on-going research project at Rockefeller Wildlife Refuge. While flying at low level over the Superior Canal System along Josephine Bayou, a large adult alligator was observed beside the carcass of a smaller adult; the latter was floating ventral side up and the tail was missing, presumably eaten by the larger alligator. The bloated condition of the carcass suggested the alligator had been killed at least 24 h prior to our observation. The TL of the larger and smaller alligator were estimated to be 3.3 m and 1.8–2.1 m, respectively.

PHOTOGRAPH BY PHILLIP L. TROSCLAIR, III

FIG. 1. An American Alligator (TL ca. 3.3 m) consuming the carcass of a smaller conspecific near Lake Des Allemands, St. Charles Parish, Louisiana.

Because adult female *A. mississippiensis* in Louisiana rarely exceed 2.7 m in TL (Joanen et al. 1984. Proc. Annu. Conf. Southeast Assoc. Fish Wildl. Agencies 38:201–211), the body size of the larger alligator strongly suggests it was a male.

The third observation was made on 1 July 2013 (1425 h) while PLT and JTL were flying transects and counting alligator nests as part of an annual population census of *A. mississippiensis* in coastal Louisiana (McNease et al. 1994. *In* Crocodiles: Proceedings of 12th Working Meeting of IUCN/SSC Crocodile Specialist Group, pp. 108–120, IUCN Publications, Gland, Switzerland). While flying in a helicopter at an altitude of approximately 46 m over an extensive freshwater marsh surrounding Lake Des Allemands (St. Charles Parish), a large alligator (TL ca. 3.3 m) was observed with the carcass of a smaller alligator held between its jaws (Fig. 1). The larger alligator was consuming the carcass when interrupted by the low-flying aircraft. The condition of the carcass suggested the smaller alligator had been killed only a short time (< 12 h) before our arrival. Although the body size of the carcass was difficult to determine because of extensive damage to the head and torso, we estimate its TL was between 1.8 and 2.1 m. As the helicopter hovered overhead, the larger alligator grasped the carcass and submerged beneath the floating marsh vegetation. As in the previous 2013 observation, the body size of the larger alligator indicated it was most likely a male.

Our observations of cannibalism by *A. mississippiensis* are noteworthy for several reasons. First, previous reports have inferred cannibalism from the presence of alligator remains or metal marking tags in stomach contents (Giles and Childs, *op. cit.*; Delany and Abercrombie 1986. J. Wildl. Manage. 50:348–352; Platt et al. 1990. Northeast Gulf Sci. 11:123–130; Rootes and Chabreck, *op. cit.*; Delany et al., *op cit.*), and direct observations of cannibalistic behavior among wild *A. mississippiensis* appear lacking in the scientific literature. Such observations are important because although stomach contents analyses are useful for determining dietary composition, this methodology reveals little about the foraging mode (i.e., predation vs. scavenging), which is crucial to understanding cannibalism as a trophic pathway (DeVault and Phodes 2002. Acta Theriol. 47:185–192). In this regard our observations are significant, as all three appear to be instances of predation rather than scavenging, a foraging mode that is common among crocodilians (Pitman, *op. cit.*; Atwell 1959. African Wildl. 13:13–22; Platt et al. 2007. Southwest. Nat. 52:310–317). Second, our observations occurred at two widely separated (> 200 km) locations and when combined with other reports from Louisiana (Giles and Childs, *op. cit.*; Taylor 1986. Proc. Ann. Conf. Southeast. Assoc. Game Fish Comm. 40:338–341; Platt et al., *op. cit.*; Rootes and Chabreck, *op. cit.*) suggest that cannibalism probably occurs in alligator populations throughout the state. Finally, our observations support the conclusion of Rootes and Chabreck (*op. cit.*) that large adult alligators (TL > 2.73 m) prey almost exclusively on large subadult and small adult conspecifics (TL = 1.2–2.1 m) rather than juveniles (TL < 1.2 m).

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SQUAMATA — LIZARDS

***AGAMA ANCHIETAE* (Anchieta's Agama). DIET.** *Agama anchietae* occurs from southern Democratic Republic of the Congo, south through Angola, Namibia, and into northwestern South Africa. Although little is known about the diet of *Agama anchietae*, southern African lizards in the genus *Agama* are known to feed heavily on ants, including ants in the genera *Pheidole*, *Crematogaster*, and *Anoplolepis* (Branch 1998. Field Guide to Snakes and Other Reptiles of Southern Africa. Struik Publishers, Cape Town. 399 pp.; Heideman 2002. J. Herpetol. 36:515–520). The only published dietary information for *A. anchietae* is that it feeds on termites and small beetles (FitzSimons 1943. The Lizards of South Africa. Transvaal Museum, Pretoria. 528 pp.). Recent observations made in the Swakop River Valley, in the west-central part of the Namib-Naukluft National Park, Namibia (22.70014°N, 14.91606°W, WGS84; elev. 194 m) extend the known diet of *A. anchietae*. On 12 May 2013 at 0949 h an adult female *A. anchietae* was noosed on a rocky hillside. Body temperature immediately after capture was 34.8°C, ground surface temperature in full sun was 33.9°C, and air temperature 10 mm above ground surface was 25.9°C. Upon capture the lizard regurgitated a large bolus of small ants (> 50 ants) that were later identified to be from the *Lepisiota capensis* species group (Marsh 1986. Madoqua 14:333–344; www.antsofafrica.org, accessed 17 January 2013). Upon closer examination it was revealed that the lizard had been situated adjacent to, and feeding from, a large aggregation of *Lepisiota* ants on the rock face. To our knowledge this is the first report of *A. anchietae* feeding on this small, ubiquitous ant, and adds to the paucity of data concerning its diet.

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FIG. 1. Predation of *Amphisbaena vermicularis* by *Apostolepis cearensis*.

***AMPHISBAENA VERMICULARIS*. PREDATION.** The natural history of amphisbaenians is poorly known, probably due to their fossorial habits (Gans and Amdur 1966. Proc. California Acad. Sci. 33:69–90; Filho et al. 1996. Scitientibus 14:57–68). *Amphisbaena vermicularis* is probably a species mainly of Caatinga and Cerrado that just enters eastern Amazonia (Hoogmoed and Ávila-Pires 1991. Bol. Mus. Para. Emílio Goeldi. sér. Zool. 7[1]:77–94), known from the Brazilian states of Pará to Minas Gerais, Mato Grosso, and Mato Grosso do Sul (Gans and Amdur, *op. cit.*; Vanzolini et al. 1980. Répteis das Caatingas. Acad. Bras. de Ciênc., Rio de Janeiro. 161 pp.; Uetanabaro et al. 2007. Biota Neotropica 7:279–289). Here, we report predation of *A. vermicularis* by the snake *Apostolepis cearensis* (Fig. 1).

On 1 February 2012 at 0700 h in the semiarid region of Bahia (9.876173°S, 41.07277°W), about 50 km from the city of Sobradinho we photographed an *Apostolepis cearensis* consuming an *Amphisbaena vermicularis* in the open and above ground. The recording took place at the time the snake had grabbed the head of amphisbaenian, which in turn revolved around its own axis in an attempt to escape the attack. *Apostolepis* snakes are known predators of amphisbaenians (Gomes et al. 2005. Herpetol. Rev. 36:170). There is one record of predation of *A. vermicularis* by *Micrurus ibiboboca* (Lisboa and Freire 2010. Herpetol. Rev. 41:73). *Apostolepis cearensis* can prey on small snakes such as *Tantilla melanocephala* (Mesquita et al. 2009. Herpetol. Rev. 40:440), but amphisbaenians have not been reported. This is a new predator record for *A. vermicularis* and also a new record of prey for *A. cearensis*.

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***ANOLIS LIOGASTER* (Guerreran Anole). CANNIBALISM.** *Anolis liogaster* is a Mexican endemic (Muñoz-Alonso and Flores-Villela 1990. Cat. Amer. Amph. Rept. 489:1–2) and information on the natural history of this species is lacking. *Anolis* lizards have previously been reported to eat other lizards (Griffith and Wingate 1994. Herpetol. Rev. 25:26) but our observation reported herein is the first known record of cannibalism in *A. liogaster*, although this behavior has been reported in other members of the genus (Gerber 1999. *In* Losos and Leal [eds.], 1999. Anolis Newsletter V, pp. 28–39).

FIG. 1. Adult specimen of *Anolis liogaster* and a partially digested juvenile.

On 19 January 2014, in Chilpancingo, Guerrero, Mexico, we collected a male *A. liogaster* that had previously been captured by a Domestic Cat (*Felis catus*). We noticed the lizard specimen had a food bolus partially protruding from its mouth, which we identified as a partially digested juvenile of the same species (Fig. 1). We hypothesize that this behavior is a response to the disturbed, urban habitat or a consequence of high population density, resulting in the elimination of both natural predators and natural prey items.

The *Anolis liogaster* specimens were deposited in the Museo de Zoología Facultad de Ciencias as MZFC 28671 for the adult and MZFC 28672 for the juvenile prey item.

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***ANOLIS SAGREI* (Brown Anole). ABSCESS.** *Anolis sagrei* is native to Cuba, the Bahamas, and Jamaica, but has been introduced to many Caribbean countries and islands, including the Yucatán Peninsula where it is widespread in coastal areas (Lee 1996. The Amphibians and Reptiles of the Yucatán Peninsula. Cornell Univ. Press, Ithaca, New York. 500 pp.). Recently, it has been reported in the Banco Chinchorro Biosphere Reserve, an atoll located 31 km off the coast of the state of Quintana Roo, México (Charruau et al. Herpetol. Conserv. Biol., *in press*). During fieldwork on the reserve in April 2012, we captured five individual *A. sagrei* with deformations, abscesses, and swelling in their jaws, principally at the point of the mouth. We collected just one lizard (CNAR IBH 26868) for observations and determination of the nature of the wounds in laboratory. Two abscesses were removed via surgery and the lizard was maintained in a terrarium for 10 months, offered mealworms (*Tenebrio molitor*) and water *ad libitum*. Six months after the first surgery, the swelling came back at the same part of the jaw and we removed the tissue for analysis. We sent a swab from the tissue for bacterial culture and antibiogram; these laboratory tests obtained bacterial cultures of the genera *Streptococcus* and *Staphylococcus*, which are considered opportunistic pathogens (Huchzermeyer 2003. Crocodiles: Biology, Husbandry and Diseases. Onderstepoort Veterinary Institute, South Africa. 337 pp.). During the capture of *A. sagrei* we observed that

these lizards fed on the eggs of ants and in some cases the ants bit the lizards, principally in the mouth. We suggest that the wound caused by the ant bites could provoke the swelling and then infection leading to abscess. After eight months the lizard could not feed by itself and was fed manually.

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***ANOLIS SAGREI* (Brown Anole). CANNIBALISM.** *Anolis sagrei* is native to the Bahamas and Cuba, but has been introduced to many tropical regions around the world (Kolbe et al. 2004. Nature 431:177–181). Although *A. sagrei* primarily eats invertebrates, it will sometimes consume other anoles (Losos 2009. Lizards in an Evolutionary Tree: Ecology and Adaptive Radiation of Anoles. University of California Press, Berkeley. 528 pp.). For example, adult *A. sagrei* are more likely to consume heterospecific juveniles than conspecifics given a choice (Gerber and Echternacht 2000. Oecologia 124:599–607). Nevertheless, cannibalism does occur in *A. sagrei* (Nicholson et al. 2000. Herpetol. Rev. 31:173–174), but in most other documented cases of *Anolis* cannibalism, the cannibalistic adult was a male rather than a female. Cannibalism by females is rare and has only been reported twice among anole species, once each in *A. cristatellus* and *A. whitemani*. One record was based on an autotomized tail found in stomach contents of a female, yet anoles will consume their own and others' shed tails (Gerber 1999. *In* Losos and Leal [eds.], 1999. Anolis Newsletter V, pp. 28–39). Additionally, a laboratory experiment demonstrated that adult female anoles ignore juveniles, whereas adult males attempt cannibalism more frequently (Stamps 1983. Behav. Ecol. Sociobiol. 12:19–33).

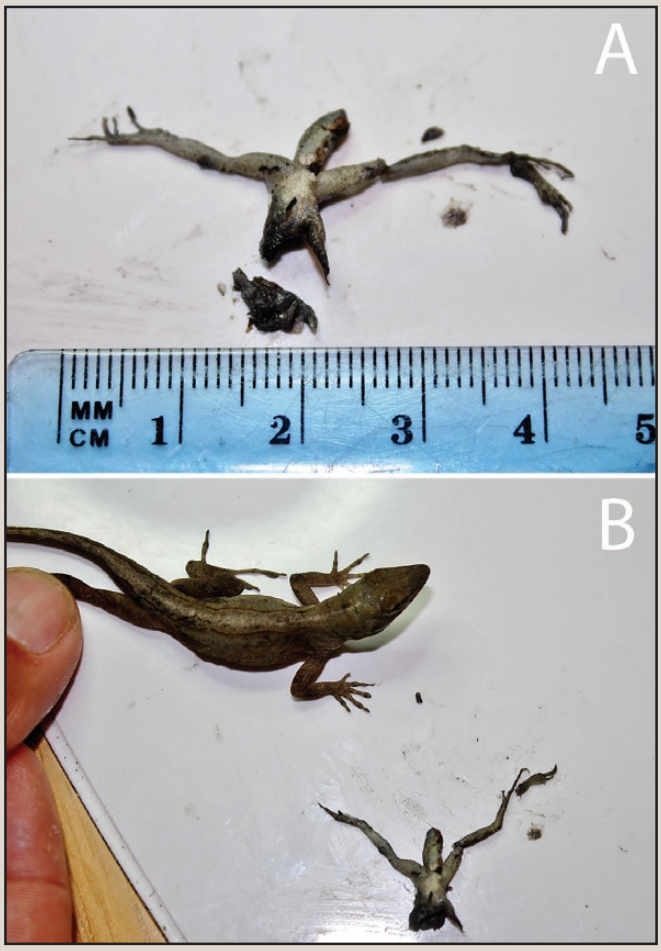

FIG. 1. Regurgitated carcass of a juvenile *Anolis sagrei* (A), and the cannibalistic adult female (B).

During our research on spoil islands in the Matanzas River near Palm Beach, Florida, USA (29.64°N, 81.21°W; WGS84), we collected an adult female *A. sagrei* that regurgitated a partially digested juvenile *A. sagrei* with only the posterior half of the abdomen, the hind legs, pelvic region, and partial tail remaining. The adult female was measured (mass = 2.63 g; SVL = 48 mm; TL = 78 mm) but the remnants of the carcass precluded accurate measurement of the cannibalized juvenile (Fig. 1). However, we identified the juvenile as female based on the absence of enlarged post-cloacal scales. To our knowledge, this is the first report of cannibalism by an adult female *A. sagrei*.

Past studies of *Anolis* suggest that competition is the primary selective force in island populations, whereas predation is more prominent in mainland populations (Calsbeek and Cox 2010. Nature 465[7298]:613–616). Depending on the frequency of cannibalism in *A. sagrei* populations, both forces may be at work because predation on young individuals by adults can influence future competition, and hence impact community structure and population dynamics (Gerber and Echternacht 2000. Oecologia 124:599–607). Thus, the role of cannibalism in driving ecological and evolutionary processes in *A. sagrei* may be particularly strong, and warrants more study.

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***ANOLIS SAGREI* (Brown Anole). EGG PREDATION.** *Anolis sagrei* is native to many islands throughout the West Indies, and invasive populations have expanded throughout Florida primarily over the last half-century (Kolbe et al. 2004. Nature 431:177–181). Similar to other anoles, *A. sagrei* produces a single-egg clutch and oviposits at regular intervals (about every 7–10 days) throughout the reproductive season (Cox and Calsbeek 2010. Evolution 64[5]:1321–1330). At present, little is known about anole oviposition behaviors, but laboratory studies suggest that females choose oviposition sites with suitable conditions for embryo development (Socci et al. 2005. Herpetologica 61:233–240; Reedy et al. 2013. Behav. Ecol. 24:39–46). Although females tend to select sites with proper ambient conditions, some eggs still succumb to mortality. Predation could be a major factor driving variation in egg mortality in the field. For example, studies of *A. limifrons* demonstrate that leaf litter invertebrates (*Solenopsis* ants, *Salasiella* snails) contribute to egg mortality (Andrews 1982. Herpetologica 38:165–171; Chalcraft and Andrews 1999. Oecologia 119:285–292). Here, we report that marsh crabs may be another important predator of *Anolis* eggs.

FIG. 1. *Armases cinereum* with partially consumed anole egg.

While surveying populations of *Anolis sagrei* on spoil islands in the Matanzas River near Palm Beach, Florida, USA (29.64°N, 81.21°W; WGS 84) on 2 October 2013, we observed a Gray Marsh Crab (*Armases cinereum*) actively consuming an anole eggshell. The crab was measured (carapace length: 10 mm, carapace breadth: 1.2 mm, claw length: 8 mm) and photographed (Fig. 1). Gray Marsh Crabs are semi-terrestrial and found from high intertidal zones to 50 m inland. They have a broad distribution along the eastern coast of the United States, and into Veracruz, Mexico (Abele 1992. Smithson. Contrib. Zool. 527:30–31). Gray Marsh Crabs readily eat fresh plant material, carrion, and organic matter picked from sediments, but they also actively stalk small crustaceans and feed on soft-bodied invertebrates and small mollusks (Buck et al. 2003. J. Exp. Mar. Biol. Ecol. 292:103–116). Although we do not know if the crab killed the egg or if it was eating the eggshell after the hatchling emerged, this observation suggests that marsh crabs opportunistically eat anole eggs.

The spoil islands where we work have extremely high densities of Gray Marsh Crabs and fiddler crabs (*Uca* sp.). In addition, because of the high abundance of hatchling *A. sagrei* during late summer, we suspect that egg density at this time is also very high, allowing for crabs to come into contact with both incubating and hatched eggs. Indeed, crabs are often observed in the same microhabitats as anole eggs (Delaney et al. 2013. Herpetol. Rev. 44:314). The ability of *A. cinereum* to eat hard-shelled mollusks suggests that this species could also consume both intact and hatched anole eggs. Because *A. sagrei* lays eggs slightly below the surface of the ground in moist soil (unpubl. data), this oviposition location provides ample opportunity for interactions between eggs and marsh crabs. Although the observed eggshell being consumed could have been from *A. carolinensis*, it is more likely from *A. sagrei* given the substantially higher density of this species at our study site. Native *A. sagrei* populations are outside the geographic range of *A. cinereum*, but similar species of marsh crabs (genera *Sesarma* and *Armases*) in the Caribbean suggest that *Anolis* lizards and *Armases* crabs have probably had interactions over the course of their evolutionary history.

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***ASPIDOSCELIS SEXLINEATA SEXLINEATA* (Six-lined Racerunner). SUPERNUMERARY CAUDAL ANOMALIES AND A BIFID TAIL.** We provide evidence that different types of wounds to the tail of an individual of *Aspidoscelis sexlineata sexlineata* can stimulate a range of responses including simple healing (i.e., closure of the wound), restoration (i.e., regeneration of the tail), development of a bifurcation (i.e., growth of a supernumerary second tail branch, Fig. 1A), or production of a cluster of supernumerary caudal extensions (i.e., growth of multiple tail branches, Fig. 1B–C). Consequently, this report expands the literature on caudal anomalies beyond references to tail bifurcation reported for an increasing number of lizard species (e.g., see Bateman and Chung-MacCoubrey 2013. Herpetol. Rev. 44:663; Vrcibradic and Niemeyer 2013. Herpetol. Rev. 44:510–511). The earliest report of a bifid tail in *A. sexlineata* known to us was published in Scientific American nearly 100 years ago (Anonymous 1915. Sci. Amer., p. 479)—that of a lizard from South Carolina. For a contemporary perspective, the examples of caudal anomalies in the three *A. sexlineata* from Alabama depicted in Fig. 1A–C are the only ones we have collectively observed in this species among several thousand specimens examined from Colorado, New Mexico, Texas, Kansas, Missouri, Louisiana, Arkansas, Oklahoma, Mississippi, Alabama, Georgia, Florida, South Carolina, and Tennessee. The recently published note (Cordes and Walker 2013. Herpetol. Rev. 44:319) on two triploid parthenogenetic *A. velox* from Utah are also the only other examples of bifid tails that can be recalled among the thousands of specimens of other species of *Aspidoscelis* examined by JMW.

From 1976–1979, SET studied the systematics (Trauth 1980. Ph.D. Dissertation, Auburn University) and natural history (Trauth 1983. Amer. Midl. Nat. 109:289–299) of *Aspidoscelis sexlineata* (= *Cnemidophorus sexlineatus*) across much of the southeast and south-central United States (Trauth and McAllister 1996. Cat. Amer. Amph. Rept. 628.1–628.12). In Alabama, only three of 201 specimens of *A. s. sexlineata* examined by SET expressed caudal anomalies other than simple tail regeneration. Two of them exhibited multiple fractures and subsequent growths of supernumerary tails (Fig. 1A–C). The phenotypically altered lizards (SET 2333; Auburn University Museum = AUM 27525; SET 2313) were collected from three south-central counties (Autauga, 32.70166°N, 86.48889°W; Chambers, 32.89288°N, 85.23701°W; Elmore, 32.57513°N, 85.94301°W, respectively). Each lizard was excavated from either activity or hibernation burrows in mostly well-drained red clay exposures, which faced S to W along secondary highways or rural dirt roads.

In SET 2333 (male, 64 mm SVL), the bifurcation developed immediately distal to the ~43rd whorl of caudal scales as the probable result of a moderately severe injury, leaving the original tail capable of growth and with an essentially anatomically normal appearance. The resulting supernumerary tail is almost as long as the original and possesses the types of scales typical of a regenerated portion of a tail (Fig. 1A). The result is what we term the classical bifid tail. In AUM 27525 (male, 74 mm SVL), the supernumerary aggregate of caudal extensions developed as a trifurcation immediately distal to the ~57th whorl of caudal scales as the probable result of multiple wounds, leaving the original tail incapable of normal growth and anatomically abnormal in appearance. A few mm distal to the trifurcation, the original tail has a bifurcation (Fig. 1B), the whole array being what we term supernumerary caudal extensions. In SET 2313 (female, 75 mm SVL), a trifurcation has developed immediately distal to the ~52nd whorl of caudal scales as the probable result of a complex wound, leaving the original tail incapable of normal growth and anatomically

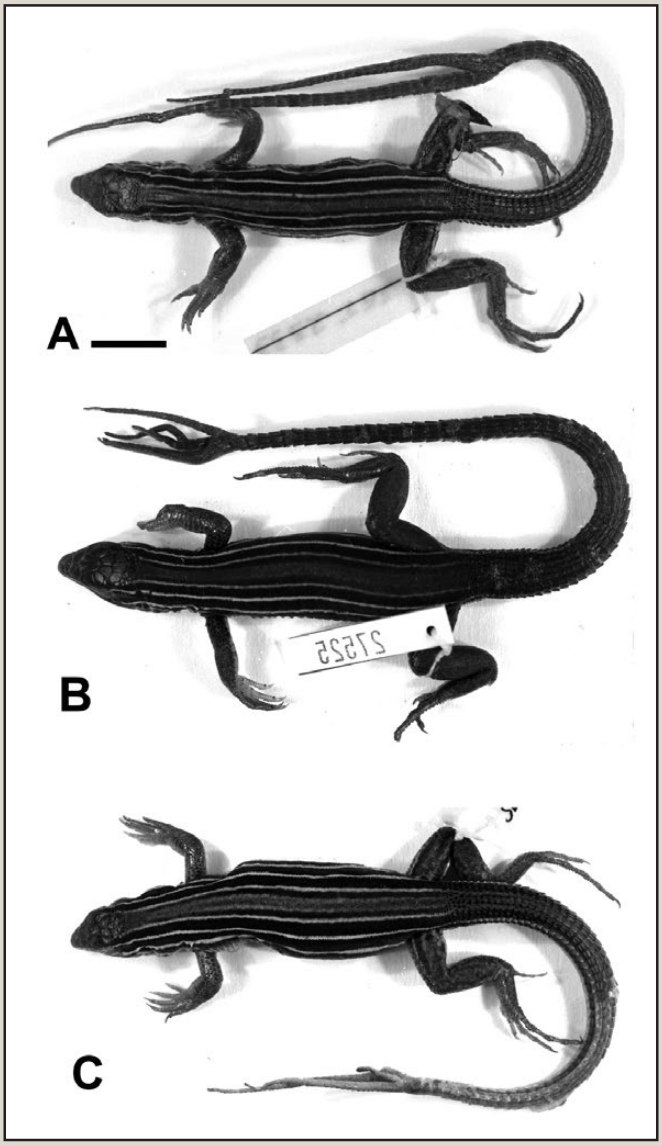

FIG. 1. Specimens of *Aspidoscelis sexlineata sexlineata* from three Alabama counties expressing bifid and multiple supernumerary tails. A) SET 2333; line = 10 mm for A–C. B) AUM 27525. C) SET 2313.

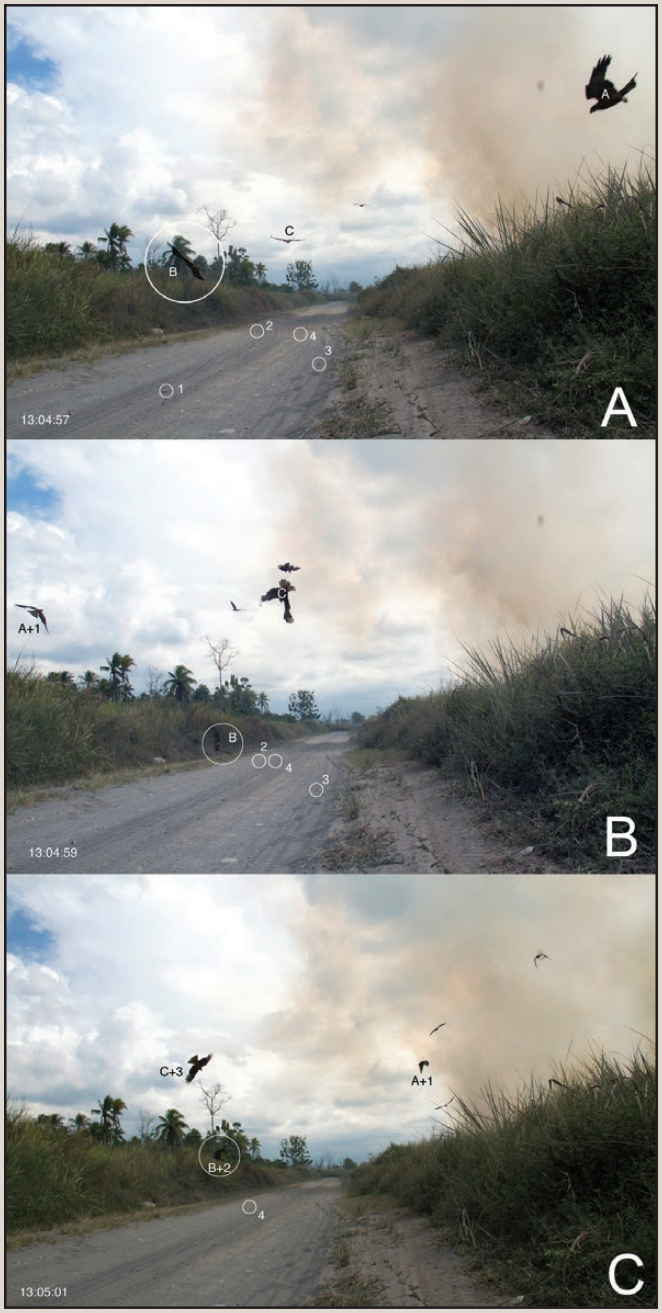

FIG. 1. A) 13:04:57 Hawk A stoops on Skink 1, Hawk B wheels towards Skink 2. B) 13:04:59 Hawk A has taken Skink 1; Hawk B is almost upon Skink 2; Hawk C, approaching from down the road, wheeling to stoop on Skink 3. C) 13:05:01 Hawks A, B and C have all taken skinks, only Skink 4 remains.

abnormal in appearance. The result in this lizard is a trifurcation that has produced a cluster of three supernumerary caudal extensions (Fig. 1C). We conclude that caudal autotomy and regeneration in whiptail lizards are examples of adaptive responses that are stimulated by a traumatic event, the nature of which on rare occasions results in production of non-adaptive structures (i.e., growth of supernumerary caudal extensions).

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***CARLIA CURTA* (Papuan Litter Skink) and *CARLIA MYSI* (Mys' Rainbow Skink). MASS AVIAN PREDATION.** *Carlia curta* and *C. mysi* are common lizards of the grasslands of the northern versant of the Papuan Peninsula, Papua New Guinea, and they occur in abundance on the disused Second World War airstrip at Dobudora, Oro (Northern) Province, Papua New Guinea (8.793950°S, 148.320333°E) located 9.5 km ESE of the provincial capital Popondetta, and 2 km NE of the domestic airport at Girua, on the eastern banks of the Girua River.

The area is low-lying (40–80 m elev.) and largely comprises grassland, swamp, small areas of tropical forest, and oil palm plantations. The grasslands are subjected to frequent and deliberate burns, set by villagers, whether clearing land for gardens, or hunting bandicoots, and fire is an ever-present factor in the

environment. During the present (August 2013) and previous (September 2006) visits to Dobudora there have always been two or three fast-burning fires on the grasslands. Wildlife has to adapt to the constant threat it poses.

Some wildlife benefit from these continual, dry-season daily, grassland fires. Birds of prey, primarily Black Kites (*Milvus migrans*), were seen in very large numbers in the vicinity of Dobudora in August 2013, congregating on trees in close proximity to the fires, or following behind the flames scavenging carcasses. Twenty were seen at any one time wheeling in the sky, up to 12 perching in a single, spindly leafless tree.

Even before the flames reached the dirt road, both species of skinks were observed running out onto its exposed sandy surface, clearly disorientated by the heat, some making the safety of the opposite side of the road, others running in circles, or even back towards the fire. At this point the kites were observed to change their hunting behavior and began predating the skinks in the open. At least a dozen kites were hunting in less than 50 m of the road, swooping down to capture disoriented skinks in their talons. Occasionally a skink was missed but flicked over in the sand, only to be almost immediately taken by a second kite coming in at an angle to the first. Our attempts to collect skinks as voucher specimens were on occasion thwarted as the lizards were snatched from in front of our hands by kites from above. No estimate of the number of skinks taken by the kites was made, or even possible due to the speed and numbers of the birds, but it was probably several dozen during the 30–40 minutes between the skinks' first appearance on the road and the fire dying down. How the number of skinks taken fleeing can be compared to those that die in the fires is also impossible to estimate but with the frequency of fires on the grasslands and the large number of kites in the vicinity it is likely that these two threats play a major part in skink survivorship and population density.

We noticed that the larger species, *C. mysi*, was more vulnerable to predation by kites than the smaller *C. curta*, many of which escaped the notice of the birds in the dusty sand and smoke. One snake was observed, either a treesnake (*Dendrelaphis* sp.) or Brownsnake (*Pseudonaja textilis*), but it crossed the road too quickly for the kites or us to react.

A sequence of three photographs, taken over a four-second period, show four *C. mysi* attempting to cross the road (Fig. 1). Skink 1 is taken by Hawk A which dives from the right, Skink 2 is taken when Hawk B comes in low from in front of camera, Hawk C flies up the road towards the camera then swoops onto Skink 3. At the end of four seconds only Skink 4 remained.

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***CARLIA SCHMELTZII* (Robust Rainbow Skink). ENVIRONMENTALLY-CUED HATCHING.** Environmentally-cued hatching (ECH), in which hatching competent embryos can choose their own hatching date by assessing and responding to risks, can include early hatching, delayed hatching, or synchronous hatching (Warkentin and Caldwell 2009. *In* Dukas and Ratcliffe [eds.], Cognitive Ecology II. The Evolutionary Ecology of Learning, Memory and Information Use, pp. 177–200. University of Chicago Press, Chicago, Illinois). For example, hatching competent frog embryos can hatch early in response to risk of attacks by wasps, snakes, and fungi (Warkentin and Caldwell, *op. cit.*). A recent review has extended ECH to reptiles (Doody 2012. Integr. Comp. Biol. 51:49–61). For instance, early hatching in Delicate Skinks (*Lampropholis delicata*) is likely an antipredator response to egg predation (Doody and Paull 2013. Copeia 2013:160–165). Although a few other lizard species can hatch early in response to being handled, ECH is not known to occur for most lizard species, presumably due to the difficulty in finding lizard eggs (Doody et al. 2009. Quart. Rev. Biol. 84:229–252) and due to the common assumption that eggs hatching while being handled is coincidental. Herein we report on an observation of early hatching in *Carlia schmeltzii* from northeastern Australia. We comment on implications for predator avoidance.

In January 2014 at around 1200 h a maintenance worker discovered two eggs under a rock in a garden in Palm Cove, Queensland, Australia (16.744307°S, 145.670962°E). The worker placed the eggs in a container, and the eggs were rolling around during transit for a few minutes before being presented to one of us (BS). Just after this time one of the eggs hatched rapidly, and the hatchling skink immediately scurried around the container. The second egg was then removed and hatched rapidly in hand, the hatchling immediately running after hatching. The hatchlings were identified as *C. schmeltzii* based upon their appearance and commonness at the site.

The handling-induced hatching in *C. schmeltzii* likely reflects early hatching in response to an increase in perceived predation risk, as observed in two other Australian skinks, *L. delicata* and *Acritoscincus platynota* (Doody and Paull, *op. cit.*; BS, unpubl.). Early hatching in response to predation risk may be widespread in Australian skinks, or perhaps in skinks in general. Further research should investigate the hatching window (plasticity in hatching age and developmental stage) and the potential predators of *C. schmeltzii*. A comparative study of ECH in skinks would determine if early hatching is an ancestral trait or if it has evolved multiple times within that group.

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***CTENOPHORUS CAUDICINCTUS* (Ring-tailed Dragon). PREDATION.** Clarifying the suite of predators can contribute to understanding how populations are regulated, and how predators influence the behavior of prey. Yet, the suite of predators is often poorly known for a given small vertebrate, especially in the tropics. Herein we report an observation of apparent predation of *Ctenophorus caudicinctus* by a Nankeen Kestrel (*Falco cenchroides*) in northwestern Australia.

At ~1100 h on 22 February 2014, we flushed a kestrel from a rocky overhang on a mesa that stood about 50 m above the surrounding savannah in the northern Pilbara region of Western Australia (22.337336°S, 119.625572°E). The kestrel left behind an upside-down dead lizard, which proved to be a gravid female *C. caudicinctus*. Closer inspection revealed two puncture marks, one each through the left shoulder region and through the right

tympanum, although there was little blood. The lizard was left at the site in case the kestrel returned for it. The air temperature at the time of the observation was ~35°C.

Although we did not observe prey capture, kestrels are generally hunters rather than scavengers (Olsen et al. 1979. Emu 79:133–138), suggesting that the raptor caught and killed the lizard just before we arrived (the lizard was in good condition). It is possible that the reproductive condition of the lizard contributed to its vulnerability to capture, as it was heavily egg-laden. Ring-tailed Dragons are common at the site, and are generally common in rocky areas where they forage for insects during the day, often at very hot temperatures. Kestrels are also relatively common at the site, and lizards are generally an important prey item; in one study lizards made up ~90% of prey items by weight (Aumann 2001. Wildl. Res. 28:379–393). In that study agamids were found in 53% of regurgitated pellets, and *C. nuchalis*, a congener of *C. caudicinctus*, was the most common reptilian prey item.

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***DAREVSKIA BRAUNERI* (Brauner's Rock Lizard). DIET.** The diet of *Darevskia brauneri* is known to consist mainly of insects, other invertebrates, berries, and overripe fruit (Darevsky 1967. Rock Lizards of the Caucasus: Systematics, Ecology and Phylogeny of the Polymorphic Groups of Caucasian Rock Lizards of the Subgenus *Archaeolacerta*. Nauka, Leningrad. 214 pp. [in Russian: English translation published by the Indian National Scientific Documentation Centre, New Delhi, 1978]). However, on 28 August 2001 on rocky outcrops of the valley of the Mzymta River in the village of Esto-Sadok, Krasnodar Krai, Russia (43.68093°N 40.27605°E; 550 m elev.) we observed an adult female holding a juvenile specimen of *Lacerta agilis* (Sand Lizard) in its jaws. This is the first recorded case of a lizard of the genus *Darevskia* predating on a vertebrate. An earlier report in the literature recorded the opposite case of *L. agilis* predating upon a lizard of the genus *Darevskia* (*D. pontica*) (Zhukov 1941. K sistematike, rasprostraneniyu i biologii *Lacerta praticola* Eversmann [Reptilia, Sauria] [Systematic, distribution and biology of *Lacerta praticola* Eversmann (Reptilia, Sauria)]. Proc. Krasnodar State Pedagogical Institute named after the 15th anniversary of the Komsomol. Krasnodar. Vol. 8. pp. 326–335 [in Russian]).

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***ELGARIA PAUCICARINATA* (San Lucan Alligator Lizard). FIELD AND PREFERRED BODY TEMPERATURES.** *Elgaria paucicarinata* is a small terrestrial lizard endemic to the mountain and foothill habitats of the Cape Region in Baja California (Grismer 2002. Amphibians and Reptiles of Baja California, Including its Pacific Islands and the Islands in the Sea of Cortés. Univ. California Press, Berkeley and Los Angeles, California. 399 pp.). Little is known about the ecology of this lizard, and even less about the thermal ecology. We present data on *E. paucicarinata* thermal ecology from Sierra de La Laguna Biosphere Reserve on the Cape Region, Baja California Sur, México. We conducted fieldwork at Segundo Valle (23.55251°N, 109.98689°W, WGS84; elev. 1770 m) on 12–14 July and 20–22 September 2011. The site is predominated by pine-oak forest vegetation (e.g., *Pinus lagunae*, *Quercus devia*, *Arbutus peninsularis*), perennial herbs, leaf litter, and granitic rocks (Arriaga and Ortega [eds.] 1988. La Sierra de la Laguna de Baja California Sur. CIBNOR. Mexico. 247 pp.). Data are based on 20 individuals (adults and juveniles) captured by hand between 0900 and 1900 h. Sex was not determined because of the lack of sexually dimorphic characters. We measured body temperature (T_b) and air temperature (T_a) with a quick-reading thermometer (Fluke 52 K/J type) immediately following capture. The substrate temperature (T_s) was measured with a non-contact infrared thermometer (Raytek Raynger ST®) at the exact point where the animal was first sighted and T_a 2 cm above the substrate. We recorded data on snout–vent length (SVL), time of capture, microhabitat type, and light condition (full sunlight, filtered sunlight, and full shade). We brought five adult individuals into a laboratory thermal gradient to measure the preferred body temperatures (T_p). The thermal gradient consisted of a glass terrarium 76 × 30 × 45 cm (long/wide/high), with soil and leaf litter, located in a room with a controlled temperature of 20°C. We offered a thermal gradient of 20–37°C by placing two 100-W daylight blue bulbs at different heights in one end of the terrarium. We took body temperatures every hour between 0900 and 1500 h, with the same thermometer used in the field.

Mean SVL was 96.8 mm (SD = 20.6, range: 58–120 mm, N = 12). Mean field T_b was 25.4°C (SD = 3.2, range: 20–31.2°C, N = 20). Mean T_a was 20.8°C (SD = 1.5, range: 17.5–24.1°C) and mean T_s was 24°C (SD = 3.6, range: 19.2–31.8°C). Both T_a and T_s were significantly correlated with body temperature (Spearman Rank Correlation, $r_s = 0.80$, $r_s = 0.84$, $P < 0.0001$, respectively). Most lizards were found on leaf litter with plant cover (N = 13), followed by leaf litter on open areas (N = 5), oak logs, and rocks (N = 1); and in full shade microhabitats (N = 11), followed by full sunlight (N = 6) and filtered sunlight (N = 3). The mean T_p was 25.8°C (SD = 3.4, range = 20.5–30.9°C). Interquartile of 25% and 75% was 24.6°C and 27.9°C, respectively. *E. paucicarinata* mean body temperature is higher than other *Elgaria* species (*E. coerulea* = 15.8°C, Brattstrom 1965. Am. Midl. Nat. 73[2]:376–422; *E. multicarinata* = 21°C, Beck 2009. *In* Jones and Lovich [eds.], Lizards of the American Southwest, pp. 484–487. Rio Nuevo Publishers, Tucson, Arizona). Compared with other gerrhonotine lizards, *E. paucicarinata* has a slightly lower T_b than *Barisia imbricata* (26.6°C; Lemos-Espinal et al. 1998. Amphibia-Reptilia 19:95–99). The positive correlation of T_b with T_s and T_a suggests that *E. paucicarinata* is not clearly thigmothermic or heliothermic. Light condition preference data give support to a thigmothermic model where lizards gain heat by moving between microhabitats with different sunlight categories, because lizards were found in open and plant-covered areas. The similarity of T_p and field T_b suggests that *E. paucicarinata* thermoregulates, but an assessment of the thermal environment is needed to determinate the patterns of thermoregulation of this species.

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***GEHYRA LACERATA* (Kanchanaburi Four-clawed Gecko). REPRODUCTION.** *Gehyra lacerata* is known from Chonburi, Kanchanaburi, Khon Kaen, Nakhon Ratchasima, Phetchaburi and Sakaeo Provinces, Thailand and possibly 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.). I know of no published accounts on reproduction of this lizard. The purpose of this note is to report on reproduction of *G. lacerata* from Thailand.

A sample of 24 *G. lacerata* consisting of 11 adult males (mean SVL = 47.1 mm ± 4.1 SD, range = 40–53 mm) and 13 adult females (mean SVL = 53.2 mm ± 5.7 SD, range = 43–59 mm) collected in 1969 and deposited in the herpetology collection of the Field Museum of Natural History (FMNH), Chicago, Illinois, USA, was examined from Thailand (Nakhon Ratchasima Province, Amphoe Pak Thong Chai, Sakerat, 14.50897°N, 101.95379°E, including: FMNH 181335, 181338–181340, 181342, 181347, 181348, 181350, 181352–181354, 181360, 181364, 181367, 181370–181372, 181388, 181393, 181407, 181411, 181414, 181418, 181421.

A cut was made in the lower abdominal cavity and the left testis or ovary was removed, embedded in paraffin, cut at 5 µm and stained with Harris hematoxylin followed by eosin counterstain. Enlarged ovarian follicles > 4 mm or oviductal eggs were counted. No histology was performed on them. Histology slides were deposited at FMNH.

The only stage observed in the testicular cycle was spermiogenesis. There were two stages of this condition: 1) full spermiogenesis in which the layers of germinal epithelium were at maximum cell number and the lumina of the seminiferous tubules were lined by sperm or clusters of metamorphosing spermatids; 2) late spermiogenesis in which the cells of the germinal epithelium were greatly reduced in number and scattered sperm were in the lumina of the markedly smaller seminiferous tubules. Males in full spermiogenesis were found by month: February (N = 1), March (N = 1), April (N = 2), June (N = 1), August (N = 1), November (N = 1), December (N = 2). Two males from September exhibited late spermiogenesis. My monthly samples of males are too small to ascertain whether the finding of late spermiogenesis in September precedes a period of testicular regression. However, my November and December male samples exhibited full spermiogenesis. The smallest reproductively active male measured 40 mm SVL and was from December (FMNH 181414).

Table 1. Monthly stages in the ovarian cycle of 13 *Gehyra lacerata* females from Nakhon Ratchasima Province, Thailand. *Indicates concurrent yolk deposition for a subsequent clutch in a female with oviductal eggs.

Month	N	Quiescent	Follicles > 4 mm	Oviductal eggs
February	2	0	1	1
March	2	0	2	0
April	1	0	0	1
May	1	0	1	0
June	1	0	0	1*
July	3	0	2	1*
August	1	1	0	0
September	1	1	0	0
November	1	1	0	0

Three stages were present in the ovarian cycle (Table 1): 1) quiescent = no yolk deposition; 2) enlarged ovarian follicles (> 4 mm); 3) oviductal eggs. Mean clutch size (N = 10) was an invariant two eggs. The smallest reproductively active female (two ovarian follicles) measured 50 mm SVL and was from March (FMNH 181353). I arbitrarily classified one slightly smaller female of 47 mm SVL (FMNH 181393) and two females of 43 mm SVL (FMNH 181411, 181339) as adults, although they could have conceivably been subadults. The presence of two females (FMNH 181364, 181372) with oviductal eggs that were undergoing concurrent yolk deposition for a subsequent clutch indicates *G. lacerata* can produce multiple clutches in the same reproductive season.

It is evident that *G. lacerata* exhibits a prolonged reproductive cycle. Examination of additional specimens will be required to ascertain whether breeding occurs year round as postulated for other lizards from south Asia (Grismer 2011. Lizards of Peninsular Malaysia, Singapore and their Adjacent Archipelagos. Edition Chimaira, Frankfurt am Main. 728 pp.).

I thank Alan Resetar (FMNH) for permission to examine *G. lacerata*.

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***GEKKO JAPONICUS* (Japanese Gecko). DIURNAL ACTIVITY.** Nocturnal behavior and thermoregulation in *Gekko japonicus* has been described in a number of works but detailed documentation of diurnal behavior is lacking (Hu and Du 2007. Acta Zoo. Sinica. 53:227–232 [in Chinese]). Here I describe diurnal activity by *G. japonicus* based on 69 observations documented at three sites in Fukuoka, Japan (Table 1). Observations took place between 23 July 2011 and 29 October 2013, occurring as early as March and as late as October. All observations occurred between 0909 h and 1745 h. Temperatures during observations ranged from 17°C to 33.9°C, with an average of 24.7°C. Diurnal behavior was most frequently observed in sunny weather, with 50.7% (N = 35) of observations occurring under mostly clear or clear skies, 30.4% (N = 21) taking place in partly cloudy weather, and 18.8% (N = 13) occurring during overcast conditions.

With the exception of one gecko seen on a stone wall, diurnal activity by *G. japonicus* was observed at retaining walls with weep holes (59.4%, N = 41), on trees (29.0%, N = 20), or on wooden signposts (10.1%, N = 7). In most instances, the geckos would almost immediately retreat into their refuge when approached. In 91.3% (N = 63) of the observations, the geckos were positioned at their refuges in one of three ways: At the entrance of the refuge at the edge of direct sunlight and shadow (40.6%, N = 28); at the refuge entrance with anterior portion of the body or head exposed to direct sunlight (37.7%, N = 26); or completely exposed outside of refuge but immediately next to the entrance (13%, N = 9). In 8.7% (N = 6) of the instances the geckos were completely exposed on a wall or the shaded side of a tree trunk with no refuge in the immediate vicinity. Body posture varied from having the ventral surface in contact with substrate to having the anterior portion of the body elevated as high as possible.

In seven instances, aggregations of two to four animals were observed at refuge entrances. All but one of these observations occurred in the months of March and April. Based on prior observations, it is known that an aggregation seen at a weep hole on 27 April 2012 had overwintered together and was in the process of gradually dispersing (Caldwell 2013. Herpetol. Rev. 44:4) and a group of four geckos observed at a signpost on 15 April 2012 is

TABLE 1. Diurnal observations of Japanese Geckos (*Gekko japonicus*) documented from 23 July 2011 to 29 October 2013.

Date	h*	Site	Weather***	°C	Microhabitat	Position	Remarks
23 Jul. 2011	1745	A	Sunny	26	Signpost	EN	1 adult next to 2 eggs adhered to shaded side
28 Sep. 2011	1030	A	Mostly sunny	25	Tree trunk	TE	1 adult
09 Apr. 2012	1717	B	Sunny	20	Weep hole	RM	1 adult
09 Apr. 2012	1717	B	Sunny	20	Weep hole	RM	1 adult
15 Apr. 2012	1609	A	Sunny	20	Weep hole	RM	1 adult
15 Apr. 2012	1700	A	Sunny	19.4	Weep hole	RM	1 adult
15 Apr. 2012	1525	A	Sunny	21	Signpost crevice	AE	2 adults and 2 juveniles
16 Apr. 2012	1300	B	Sunny	22	Weep hole	RM	1 adult
16 Apr. 2012	1309	B	Sunny	22	Weep hole	RM	1 adult
22 Apr. 2012	1514	A	Partly cloudy	22	Tree fork	EN	1 adult
22 Apr. 2012	1537	A	Partly cloudy	22.5	Weep hole	RM	1 adult
22 Apr. 2012	1637	A	Partly cloudy	21.9	Weep hole	RM	1 adult
22 Apr. 2012	1637	A	Partly cloudy	22	Weep hole	RM	1 adult
22 Apr. 2012	1604	A	Partly cloudy	22	Signpost crevice	AE	1 adult
22 Apr. 2012	1450	A	Sunny	21	Signpost crevice	AE	2 juveniles
22 Apr. 2012	1507	A	Sunny	23	Signpost crevice	AE	1 adult
27 Apr. 2012	1545	B	Sunny	19	Weep hole	RM	4 geckos at mouth of weep hole
29 Apr. 2012	909	A	Sunny	21.3	Tree cavity	EN	1 adult
29 Apr. 2012	931	A	Sunny	20	Weep hole	AE	1 adult
29 Apr. 2012	931	A	Sunny	20	Weep hole	RM	1 adult
13 May 2012	1230	A	Cloudy	24	Tree trunk	TE	1 adult
13 May 2012	1110	A	Cloudy	21.8	Weep hole	AE	1 adult
13 May 2012	1110	A	Cloudy	21.8	Weep hole	AE	1 adult
13 May 2012	1110	A	Cloudy	21.8	Weep hole	AE	1 adult
13 May 2012	1030	A	Mostly cloudy	21.1	Signpost crevice	AE	1 adult
20 May 2012	1133	A	Cloudy	20	Tree cavity	RM	1 adult
20 May 2012	1201	A	Cloudy	22.8	Weep hole	RM	1 adult
20 May 2012	1201	A	Cloudy	22.8	Weep hole	RM	1 adult
20 May 2012	1303	A	Mostly cloudy	20	Weep hole	AE	3 geckos at mouth of weep hole
20 May 2012	1303	A	Mostly cloudy	20	Weep hole	RM	1 adult
22 May 2012	1330	C	Partly cloudy	23.5	Weep hole	AE	1 adult
22 May 2012	1330	C	Partly cloudy	23.5	Weep hole	AE	1 adult
22 May 2012	1330	C	Partly cloudy	23.5	Weep hole	AE	1 adult
23 May 2012	1330	C	Partly cloudy	23.5	Weep hole	AE	1 adult
23 May 2012	1330	C	Partly cloudy	23.5	Weep hole	AE	1 adult
24 May 2012	1330	C	Partly cloudy	23.5	Weep hole	AE	1 adult
28 May 2012	1501	C	Sunny	26.3	Weep hole	AE	1 adult
28 May 2012	1501	C	Sunny	26.3	Weep hole	AE	1 adult
03 Jun. 2012	1340	A	Sunny	26	Tree cavity	EN	1 adult
03 Jun. 2012	1420	A	Mostly sunny	28	Weep hole	RM	1 adult
07 Jun. 2012	1307	C	Partly cloudy	26.3	Weep hole	RM	1 adult
07 Jun. 2012	1307	C	Partly cloudy	26.3	Weep hole	RM	1 adult
12 Jun. 2012	1306	C	Mostly cloudy	27.9	Stone wall	TE	1 juvenile on top of low wall with no weep holes
12 Jun. 2012	1346	C	Partly cloudy	27.5	Weep hole	RM	1 adult
12 Mar. 2013	1700	A	Mostly sunny	20.3	Tree cavity	AE	1 adult and 1 juvenile
12 Mar. 2013	1645	A	Mostly sunny	20.3	Tree cavity	RM	2 adults
12 Mar. 2013	1650	A	Mostly sunny	20.3	Tree cavity	RM	2 adults
12 Mar. 2013	1715	A	Mostly sunny	20.3	Tree fork	EN	1 adult
21 Jul. 2013	1316	A	Partly cloudy	33	Tree branch	EN	1 adult retreated into ferns surrounding trunk

(continued on next page)

Table 1. Continued.

Date	h*	Site	Weather***	°C	Microhabitat	Position	Remarks
21 Jul. 2013	1322	A	Mostly cloudy	32.5	Tree cavity	RM	1 adult
21 Jul. 2013	1245	A	Mostly sunny	33	Tree cavity	RM	1 adult
21 Jul. 2013	1254	A	Mostly sunny	33	Tree cavity	RM	1 adult
21 Jul. 2013	1305	A	Partly cloudy	33	Tree fork	EN	1 adult
21 Jul. 2013	1340	A	Cloudy	32	Tree trunk	TE	1 adult
06 Aug. 2013	1330	C	Sunny	33.9	Weep hole	RM	1 adult
14 Aug. 2013	945	A	Partly cloudy	28.5	Tree cavity	AE	1 adult
14 Aug. 2013	1100	A	Mostly sunny	30.5	Tree trunk	TE	1 adult
14 Aug. 2013	1019	A	Partly cloudy	28.5	Tree trunk	TE	1 adult
14 Aug. 2013	1023	A	Partly cloudy	29.7	Weep hole	AE	1 adult
14 Aug. 2013	937	A	Partly cloudy	29	Signpost crevice	AE	1 adult
26 Aug. 2013	1640	C	Mostly sunny	28	Weep hole	AE	1 adult
26 Aug. 2013	1640	C	Mostly sunny	28	Weep hole	AE	1 adult
28 Sep. 2013	1145	C	Sunny	29.9	Weep hole	AE	1 adult
28 Sep. 2013	1144	C	Sunny	29.9	Weep hole	EN	1 adult
01 Oct. 2013	1330	C	Sunny	28.3	Weep hole	AE	1 adult
01 Oct. 2013	1331	C	Sunny	28.3	Weep hole	RM	1 adult
01 Oct. 2013	1332	C	Sunny	28.3	Weep hole	RM	1 adult
10 Oct. 2013	1130	A	Partly cloudy	25.4	Tree fork	EN	1 adult
29 Oct. 2013	1328	C	Mostly sunny	17	Weep hole	RM	1 adult

A = 33.5894°N, 130.4583°E*; B = 33.5973°N, 130.3749°E*; C = 33.5862°N, 130.3861°E*
* All observations overlapping in time occurred at neighboring refuges
** datum WGS84
*** Per terms defined by the National Oceanic and Atmospheric Administration
RM = At refuge entrance just out of direct sunlight
AE = At refuge entrance with anterior portion of body in direct sunlight
NR = Completely outside refuge immediately next to entrance
TE = On tree trunk or wall near no immediate refuge

also known to have overwintered together. In all other instances, single animals were observed.

In five instances I was able to observe geckos at weep holes for extended periods of time, ranging from 15 to 60 minutes from 3–5 m away. All geckos demonstrated the same behavior; each would expose its head or anterior half to direct sunlight, retreat into the hole when a pedestrian or potential predator (e.g., a dog or a bird) would approach, and subsequently return to the same position within ten minutes. The only other movement type observed was changes in body posture. No incidents of predation by or on the geckos were observed.

Gekko japonicus is reported to primarily be a sit-and-wait predator (Werner et al. 1997. Asiatic Herpetol. Res. 7:153–165), and foraging cannot be ruled out here. However, many of these observations, particularly instances in which the geckos in refugia expose the anterior portions of their bodies to direct sunlight and/or exhibit postural changes, are indicative of thermogulatory behavior. Though it is not widely documented, diurnal thermoregulation probably occurs in a large number of nocturnal reptiles (Kearney and Predavec 2000. Ecol. 81:2984–2996). *Christinus marmoratus*, a nocturnal gecko species, is reported to engage in diurnal thermoregulation largely through refuge selection and postural variation (Kearney and Predavec 2000, *op. cit.*) and a study by Dial (1978. Herpetologica 34:191–201) indicated that *Coleonyx brevis*, another nocturnal gecko, actively engages in diurnal thermoregulation while under cover. Much of the activity reported here suggests diurnal thermoregulatory behavior occurs in *G. japonicus* as well.

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***GONATODES HUMERALIS* (Trinidad Gecko). PREDATION.** *Gonatodes humeralis* is a small (max. SVL = 42 mm) sphaerodactylid gecko, common throughout much of the Amazonian region, present both in rainforest and in disturbed habitats like secondary forest and urban parks with trees (Ávila-Pires et al. 2011. Herpetol. Brasil. 1:111–112). It is typically found on tree trunks up to 1.5 m above the ground, but it also occurs in leaf litter and higher up within trees (Ávila-Pires 1995. Zool. Verh. Leiden 299:1–706). This note reports a single observation of predation on *G. humeralis* by a Spotted Puffbird (*Bucco tamatia*).

On 13 March 2012 at 1647 h during fieldwork at Curiau Protection Area (0.238056°N, 51.129444°W; datum WGS84), Macapa, Amapa, northern Brazil, we observed an adult Spotted Puffbird predating an adult female *G. humeralis* (SVL = 35 mm). The puffbird was perched on a tree branch, staring at the trunk of the tree. After locating the gecko, the bird flew to the trunk and captured it, returning to the canopy soon after, with the gecko on

PHOTO BY K.M.O. AGUIAR

FIG. 1. A Spotted Puffbird (*Bucco tamatia*) preying on an adult female *Gonatodes humeralis* in Curiau Protection Area, Macapa, Amapa, North Brazil.

its beak (Fig. 1). The bird then began to beat the gecko against the tree branch, killing it shortly thereafter. The Spotted Puffbird is a insectivorous and frugivorous bird (Sigrist 2013. Avifauna Brasileira. Editora Avisbrasilis. 594 pp.). This is another record of a sphaerodactylid gecko in the diet of *B. tamatia*, and the first record of *G. humeralis* predation by this species.

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***GYMNODACTYLUS GECKOIDES* (Naked-toed Gecko, Lagartixa). HATCHLING SIZE/BEHAVIOR.** *Gymnodactylus geckoides* is endemic to Caatinga in northeastern Brazil (Cassimiro and Rodrigues 2009. Zootaxa 2008:38–52). Females appear to produce eggs continuously throughout the year (Vitt 1986. Copeia 1986:773–786) and clutch size is usually comprised of one egg (rarely two) with a calcareous shell, which is deposited under rocks or in hollow fallen logs (Vanzolini et al. 1980. Répteis das Caatingas. Academia Brasileira de Ciências, Rio de Janeiro. 161 pp.; Vitt 1986, *op. cit.*; Vitt 1995. Occ. Pap. Oklahoma Mus. Nat. Hist. 1:1–129).

On 9 October 2013 we collected one adult and one juvenile of *G. geckoides* from Brumado, Bahia state, Brazil, located within Caatinga domain (14.203889°S, 41.665278°W; 422 m elev.). We measured the two lizards with a digital caliper (± 0.01 mm) for snout–vent length (SVL) and tail length (TL). The juvenile had

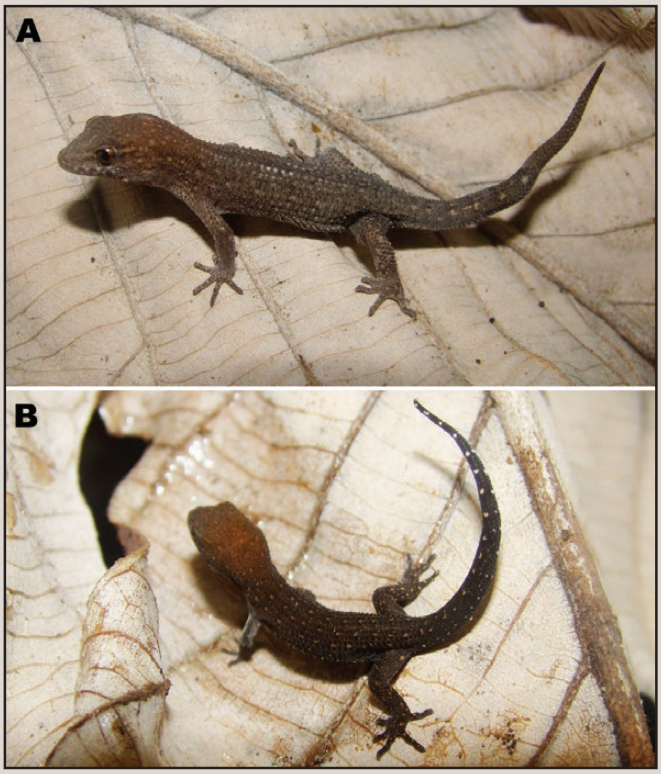

FIG. 1. A) An adult individual of *Gymnodactylus geckoides* (UFMG 1908) and B) a juvenile individual of *G. geckoides* (UFMG 1909) showing defensive tail display.

SVL = 19.41 mm and TL = 20.59 mm, and the adult had SVL = 35.22 and TL = 35.0 mm. It is believed that the juvenile was a recent hatchling due to its smaller size than the minimum SVL reported by Vitt (1986, *op. cit.*) (SVL = 20 mm) in Exu city, Pernambuco state, Brazil. The specimen here reported, probably a recent post-hatchling, represents a new record for minimum body size for a *G. geckoides* juvenile.

A defensive tail display was made by both lizards (Figs. 1A, B), and this behavior apparently is common in some Brazilian geckos (Colli et al. 2003. J. Herpetol. 37:694–706; Brandão and Motta 2005. Phyllomedusa 4:139–145), but it has not been reported for this species. It is evidence for possible mimicry of scorpions, as they use the same microhabitats, are exposed to the same potential predators, and present similar behaviors when threatened (Brandão and Motta 2005, *op. cit.*). There is little published information about the life history and behavior of this species; this report adds to the knowledge of these phyllodactylid lizards from Brazil.

The *G. geckoides* specimens (UFMG 1908–1909) were deposited in the Herpetological Collection of Universidade Federal de Minas Gerais. We are grateful to CAPES for doctorate fellowships awarded to SCG.

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***HEMIDACTYLUS FRENATUS* (Common House Gecko). BICEPHALY.** *Hemidactylus frenatus* is a small gecko species distributed primarily in Southeast Asia (Das 2010. A Field Guide

FIG. 1. Photo of bicephalic *Hemidactylus frenatus* from Koror, Palau.

to the Reptiles of South-east Asia. New Holland Publishers, London. 376 pp.). Individuals are common in urban or otherwise disturbed areas. On 8 February 2014, SK observed a small shedding *H. frenatus* fall from the ceiling of a residence in Koror, Palau (7.342°N, 134.478°E). Upon examination the lizard was found to be bicephalic (Fig. 1), with two heads joined medially directly posterior to the eyes. This abnormality is likely either parapagus, a fusion of two individuals referred to as conjoined twins, or diprosopus, a duplication of facial tissues on the head commonly called craniofacial duplication. The animal appeared healthy and alert, moving with the rapidity found in unaffected individuals. All four eyes appeared to be functional, as did both mouths, but prey capture and handling was not observed. To our knowledge, this is the first published case of bicephaly in this species. The gecko was unharmed and released outside near the point of capture.

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***HEMIPHYLLODACTYLUS TITIWANGSAENSIS* (Titiwangsa Slender Gecko). REPRODUCTION.** *Hemiphyllodactylus titiwangsaensis* is restricted to the Malaysian state of Pahang (Grismer 2011. Lizards of Peninsular Malaysia, Singapore and their Adjacent Archipelagos. Edition Chimaira, Frankfurt am Main. 728 pp.). Grismer (2011, *op. cit*) reported gravid females carrying two eggs during March, May, July, August and October and postulated breeding occurred throughout the year. The purpose of this note is to add information on the reproductive cycle of *H. titiwangsaensis* from a histological examination of museum specimens.

A sample of ten *H. titiwangsaensis* from Cameron Highlands, Panang state, West Malaysia collected during 2005, 2008, 2010, 2011 and deposited in the herpetology collection of La Sierra University (LSUHC), Riverside, California was examined: LSUHC 7208, 7209, 7212, 7213, 9161, 9162, 9076, 9815, 10254, 10273. The sample consisted of eight females (mean SVL = 52.1 mm ± 2.4 SD, range = 48–55 mm), one male, SVL = 58 mm and one subadult, SVL = 38 mm.

TABLE 1. Stages in the ovarian cycle of eight *Hemiphyllodactylus titiwangsaensis* from Cameron Highlands, Panang State, Malaysia.

Month	N	Quiescent	Enlarged follicles > 4 mm	Oviductal eggs
March	3	0	2	1
June	1	1	0	0
August	2	1	1	0
September	1	1	0	0
November	1	0	0	1

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

The one male examined was from March and was undergoing spermiogenesis (lumina of the seminiferous tubules were lined by sperm or clusters of metamorphosing spermatids).

Three stages were found in the ovarian cycle (Table 1): 1) quiescent, no yolk deposition; 2) enlarged ovarian follicles > 4 mm; 3) oviductal eggs. Mean clutch size for five females = 1.8 ± 0.45 SD, range = 1–2. Reproductive activity at opposite ends of the year indicates *H. titiwangsaensis* has an extended reproductive cycle as postulated by Grismer (2011, *op. cit.*). Congeners of the parthenogenetic *H. typus* from Hawaii similarly underwent an extended period of reproduction as they exhibited reproductive activity in seven of nine months examined (Goldberg 2012. Gekko 6:23–25).

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***HOLBROOKIA LACERATA SUBCAUDALIS* (Southern Spot-tailed Earless Lizard). REFUGIA AND COMMENSALISM.** The use of ground squirrel and other mammal burrows by many species of lizards has been well-documented. Among those reports: juvenile *Uta stansburiana* (Side-blotched Lizard) in central California stayed in the burrows of *Otospermophilus beecheyi* (California Ground Squirrel) from July to November (Doughty and Sinervo 1994. J. Herpetol. 28:485–490); burrows of *Ictidomys mexicanus* (Mexican Ground Squirrel) are sometimes used by *Holbrookia propinqua* (Keeled Earless Lizard) to escape predation (Cooper 2000. Behaviour. 137:1299–1315); and a positive correlation was found between the number of prairie dog burrows and abundance of *H. maculata* (Lesser Earless Lizard; Davis and Theimer 2003. Amer. Midl. Nat. 150:282–290).

Knowledge of the life history requirements and population dynamics of the rare and elusive *H. l. subcaudalis* is extremely limited. Nearly everything that has been reported on its natural history, from direct observation, comes from the 1950s research of Ralph Axtell, who described two subspecies, *H. l. lacerata* (Northern Spot-tailed Earless Lizard) and *H. l. subcaudalis* (Axtell 1956. Bull. Chicago Acad. Sci. 10[11]:163–179). Axtell reported that *H. l. lacerata* will use tall grass and cracks in the earth

as escape shelters, but that "rocks, tin, boards, etc., are never used..." (Axtell 1954. MS Thesis. Univ. of Texas at Austin). Axtell also reported on the use of mammal burrows by other members of the genus (Axtell 1958. Ph.D. Dissertation. Univ. of Texas at Austin.) but never observed that behavior in *H. l. subcaudalis* (R. Axtell, pers. comm.). This is the first report of the use of ground squirrel or any other type of burrows by *H. l. subcaudalis*. In this note we present evidence that *H. l. subcaudalis* not only uses ground squirrel burrows, but that it is dependent on them at this site.

On 18 March 2013, while surveying for *H. l. subcaudalis* at Laughlin Air Force Base (LAFB) in southern Val Verde County, Texas, we observed two of the lizards retreat into Mexican Ground Squirrel burrows. We observed the behavior again on 16 April and 21 May 2013. Altogether, we observed the behavior eight times (out of 16 total observations). Of the eight lizards not observed to escape into ground squirrel burrows, two attempted to hide under the tires of our vehicle, one dashed across the road ahead of us and we couldn't determine what type of refuge it took, and five were captured by running them down on foot before they could find any type of escape shelter.

The Southern Spot-tailed Earless Lizard occurs on relatively flat substrates composed of soils that are loamy, loamy-clay, clay-loam, clay, rarely sandy loam, and never pure sand (Axtell 1956, *op. cit.*; Duran and Axtell 2010. Rept. to Texas Parks and Wildlife Dept., Contract #199464). The habitat at LAFB where this population occurs includes about 718 ha on and around aircraft runways in the western part of the base. The substrate is flat, loamy, and hard-packed. The site is sparsely vegetated, even when rainfall is near the 43.6 cm yearly average for Del Rio, Texas, but at the time of our visits, the region was experiencing drought, vegetation was even more sparse than usual, and lizards were quite conspicuous when present. The site is mown frequently to about 15 cm, mostly to discourage birds that might collide with aircraft. Several decades of mowing has replenished topsoil, has converted former agricultural fields and overgrazed thornscrub into grassland, and has, inadvertently, restored and maintained habitat for *H. l. subcaudalis*. Another result of the continuous mowing is that, except for an occasional stunted *Prosopis glandulosa* (Honey Mesquite) and a few stands of denser grass in moist depressions, the landscape mostly lacks escape cover, such as tall grass, dead or fallen trees, low growing shrubs, leaf litter, and cacti that might be available under different management regimes. Additionally, LAFB is enclosed by high fencing which excludes people and most medium-sized burrowing mammals. We observed numerous 1.9–2.5 cm diameter burrows, probably created by small rodents, but these burrows may have been too small for utilization by *H. l. subcaudalis*, and we saw no evidence that it was using them. We found no published or anecdotal reports of *H. lacerata* creating its own burrows. We did not observe *H. l. subcaudalis* escaping into refugia other than ground squirrel burrows. That we were able to catch lizards by running them down on foot may be the most informative anecdote to illustrate the paucity of escape cover at this site.

Lacking other types of refugia, *H. l. subcaudalis* appears to be dependent on ground squirrel burrows for escape cover at this location. The relationship between *I. mexicanus* and *H. l. subcaudalis* at this site is an apparent case of commensalism.

The Southern Spot-tailed Earless Lizard has been extirpated from much of its historic range. The observations at LAFB were the first reported observations of the subspecies since one individual was caught in a pitfall trap on the Chaparral Wildlife Management Area in LaSalle Co., Texas, in 1997 (Duran and Axtell 2010, *op. cit.*). The specimens we collected at LAFB were the first since a specimen was taken by Andy Price in Kinney Co., Texas in 1993 (Duran and Axtell 2010, *op. cit.*).

Limited knowledge of the life history requirements of *H. l. subcaudalis* has made planning effective conservation difficult. Evidence of the subspecies' close relationship to ground squirrels at this location may provide an important clue to restoring and maintaining populations, particularly in cases where man-made disturbance has created conditions under which the availability of escape cover may be a limiting factor.

This work was performed under Texas Parks and Wildlife Department Scientific Research Permit #SPR-0302-204. The live specimens were donated to the Fort Worth Zoo in Fort Worth, Texas. The zoo is attempting to breed the subspecies in captivity in hopes of reintroducing it into the wild.

We would like to thank the staff at Laughlin Air Force Base for permitting and participating in this research.

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***JAPALURA SWINHONIS* (Swinhole's Japalura) and *TAKYDROMUS SAUTERI* (Sauter's Grass Lizard). PREDATION.** On 25 September 2013 at 0912 h along the roadside on Orchid Island, Taiwan (22.03333°N, 121.00916°E; 70 m elev.), one of us (CMW) observed and photographed an adult male *Japalura swinhonis* predating an adult *Takydromus sauteri*. The adult grass lizard was being consumed tail-end first (Fig. 1). During our observations, the *J. swinhonis* carried its prey from the ground up onto the trunk of a tree. Other *T. sauteri* individuals were observed on leaves of Japanese silver-grass (*Miscanthus floridulus*) along the forest edge in the vicinity. Most individuals move from leaf to leaf or are active on the ground and at night some individuals rest on the upper surface of a leaf (Huang 2006. J. Herpetol. 40:267–273). *Japalura swinhonis* is a sit-and-wait forager, which perches on tree trunks or on the ground at the edges of forests on Orchid Island. Previously, *J. swinhonis* was known to consume invertebrates exclusively, including ants (50%) and crickets (16.67%)

PHOTO BY C. M. WANG

FIG. 1. Adult male *Japalura swinhonis* consuming an adult *Takydromus sauteri* tail-end first.

(Huang 2007. Zool. Sci. 24:181–188). These two lizard species commonly co-occur along forest edges on Orchid Island, Taiwan (Huang 2004. Ph.D thesis, Cornell University, Ithaca, New York), which could result in substantial overlap between them.

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***LEPIDOPHYMA GAIGEAE* (Gaige's Tropical Night Lizard). ENDOPARASITES.** *Lepidophyma gaigeae* occurs in Querétaro and Hidalgo, Mexico (Bezy and Camarillo 2002. Nat. Hist. Mus. Los Angeles Co., Contrib. Sci. 493:1–41). Goldberg et al. (2002. Texas J. Sci. 54:282–284) previously reported one species of Cestoda, *Bitegmen gerrhonoti*, and two species of Nematoda, *Spauligodon giganticus* and *Ascaridia* sp., in *L. gaigeae*. The purpose of this note is to add to the helminth list for *L. gaigeae*.

Two *L. gaigeae* (mean SVL = 58.0 mm ± 2.8 SD, range = 56–60 mm) collected August 1972 in Querétaro, Mexico and deposited in the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA as LACM 106808, 106809 were examined for helminths.

The digestive tract was removed through a mid-ventral incision and its contents were examined for helminths using a dissecting microscope. Only nematodes were found, which were cleared in a drop of lactophenol on a coverslipped microscope slide and studied under a compound microscope. One species of Nematoda, *Spauligodon oxkutzcabiensis*, was found in the intestines (N = 21, prevalence [number infected/number examined × 100] = 100%; mean intensity [mean number infected individuals] = 10.5 ± 12.0 SD, range = 2–19. Voucher helminths were deposited in the United States National Parasite Collection, Beltsville, Maryland, USA as USNPC 107882.

Spauligodon oxkyutzcabiensis was described from *Thecadactylus rapicauda* collected in the Yucatán by Chitwood (1938. Publ. Carneg. Inst. Washington 491:52–66) and is commonly found in lizards from Mexico and Central America. The distribution of hosts for *S. oxkutzcabiensis* is summarized in (Goldberg and Bursey 2012. Comp. Parasitol. 79:269–274). Infection occurs from contact with contaminated substrate or conceivably from licking the ground (see Goldberg and Bursey 1992. J. Parasitol. 78:539–541). *Spauligodon oxkutzcabiensis* is separated from the congener *S. giganticus* based on ornamentation of the eggs and number of spines on the tail of the female; eggs of *S. giganticus* with one polar knob, eggs of *S. oxkutzcabiensis* with a knob on each pole; tail of female *S. giganticus* with 10–11 spines, tail of female *S oxkutzcabiensis* with 13–15 spines (Chitwood, *op. cit.*; Read and Amrein 1953. J. Parasitol. 39:365–370). Both *S. giganticus* and *S. oxkutzcabiensis* have previously been reported in different representatives of sceloporine lizards from Mexico, including *Sceloporus grammicus* and *S. mucronatus* (Goldberg et al. 2003. Southwest. Nat. 48:208–217. *Lepidophyma gaigeae* represents a new host record for *Spauligodon oxkutzcabiensis*.

We thank G. Pauly (LACM) for permission to examine *L. gaigeae*.

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***LEPIDOPHYMA SYLVATICUM* (Madrean Tropical Night Lizard). ENDOPARASITES.** *Lepidophyma sylvaticum* occurs along the Sierra Madre Oriental from Nuevo León to Veracruz, Mexico (Bezy and Camarillo R. 2002. Nat. Hist. Mus. Los Angeles Co., Contrib. Sci. 493:1–41). To our knowledge, there are no reports of helminths from *L. sylvaticum*. The purpose of this note is to establish the initial helminth list for *L. sylvaticum*.

Eight *L. sylvaticum* (mean SVL = 79.0 mm ± 7.3 SD, range = 70–90 mm) collected in 1973 and deposited in the herpetology collection of the Natural History Museum of Los Angeles County, Los Angeles, California, USA (LACM 106744–106746, Hidalgo state, Mexico; LACM 106781–106785, Nuevo León state, Mexico), were examined for helminths.

The digestive tract was removed through a mid-ventral incision and its contents were examined for helminths using a dissecting microscope. Only nematodes were found, which were cleared in a drop of lactophenol on a coverslipped microscope slide and studied under a compound microscope. Four species of Nematoda were found: *Aplectana herediaensis (*small, large intestines, N = 1187), prevalence (number infected/number examined × 100) = 100%; mean intensity (mean number infected individuals) = 148.4 ± 99.7 SD, range = 1–292; *Parapharyngodon alvarengai* (large intestine, N = 2), prevalence = 13%); *Physaloptera* sp. (third stage larvae, stomach, N = 5), prevalence = 38%, mean intensity 1.7 ± 1.2 SD, range = 1–3; ascarid larvae (body cavity, N = 2), prevalence = 13%.

Voucher helminths were deposited in the United States National Parasite Collection (USNPC), Beltsville, Maryland, USA as: *Aplectana herediaensis* (USNPC 107962, 107963); *Parapharyngodon alvarengai* (USNPC 107694); *Physaloptera* sp. (USNPC 107695); ascarid larvae (USNPC 107696).

Aplectana herediaensis was described from *Lepidophyma flavimaculatum* from Costa Rica (Bursey et al. 2006. Carib. J. Sci. 42:164–170) and was later found in *L. flavimaculatum* from Panama (Bursey et al. 2007. Comp. Parasitol. 74:108–140) and *L. micropholis* from San Luis Potosí (Goldberg and Bursey 2011 Herpetol. Rev. 43:648–649). *Parapharyngodon alvarengai* was described from *Mabuya maculata* (currently *Trachylepis atlantica*) from Brazil by Freitas (1957. Mem. Instit. Oswaldo Cruz 55:21–45) and is known from the lizards *Anolis nebulosus, Phyllodactylus lanei, Sceloporus nelsoni* and *Urosaurus auriculatus* of Mexico as well as *Mesoscincus managuae* from Nicaragua and *Ameiva ameiva, Hemidactylus agrius* and the toad *Rhinella icterica* from Brazil (Anjos et al. 2011. Neotrop. Helminthol. 5:285–290; Goldberg and Bursey. 2012. Comp. Parasitol. 79:269–274). There are many reports of amphibians and reptiles containing third stage larvae of *Physaloptera* sp. but no adults (Goldberg et al. 1993. Bull. South. California Acad. Sci. 92:43–51; Goldberg et al. 2009. Comp. Parasitol. 76:258–266). These amphibians and reptiles likely serve as paratenic (= transport) hosts with development completed in a carnivore that feeds on them. Vertebrates typically serve as intermediate hosts for larval ascaroids in which development to the stage infective to the definitive host occurs (Anderson 2000. Nematode Parasites of Vertebrates, Their Development and Transmission. CABI Publishing Oxon, UK. 650 pp.) *Lepidophyma sylvaticum* represents a new host record for *Aplectana herediaensis, Parapharyngodon alvarengai, Physaloptera* sp. (3rd stage larva), and ascarid larvae.

We thank G. Pauly (LACM) for permission to examine *L. sylvaticum*.

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***LEPIDOPHYMA TUXTLAE* (Tuxtla Tropical Night Lizard). ENDOPARASITES.** *Lepidophyma tuxtlae* occurs from the Sierra de Los Tuxtlas of central Veracruz west and southward to northern Oaxaca and northern Chiapas, Mexico (Calderón Mandujano et al. 2007. *In* IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2 downloaded on 13 December 2013). To our knowledge, there are no reports of helminths from *L. tuxtlae*. The purpose of this note is to establish the initial helminth list for *L. tuxtlae*.

Three *L. tuxtlae* (mean SVL = 60.0 mm ± 2.0 SD, range = 58–62 mm) collected July 1984 from Veracruz, Mexico and deposited in the herpetology collection of the Natural History Museum of Los Angeles County (LACM 136354, 136357, 136358) were examined for helminths.

The digestive tract was removed through a mid-ventral incision and examined for helminths using a dissecting microscope. Only nematodes were found, which were cleared in a drop of lactophenol on a coverslipped microscope slide and studied under a compound microscope. One species of Nematoda, *Aplectana herediaensis*, was found in the intestines (N = 209, prevalence [number infected/number examined × 100] = 100%; mean intensity [mean number infected individuals] = 69.7 ± 20.2 SD, range = 58–93). Voucher helminths were deposited in the United States National Parasite Collection Beltsville, Maryland as USNPC 107883.

Aplectana herediaensis was described from *Lepidophyma flavimaculatum* from Costa Rica (Bursey et al. 2006. Carib. J .Sci. 42:164–170) and was later found in *L. flavimaculatum* from Panama (Bursey et al. 2007. Comp. Parasitol. 108–140) and *L. micropholis* from San Luis Potosí, Mexico (Goldberg and Bursey 2012. Herpetol. Rev. 43:648–649). *Lepidophyma tuxtlae* represents a new host record for *Aplectana herediaensis*.

We thank G. Pauly (LACM) for permission to examine *L. tuxtlae*.

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***OPLURUS QUADRIMACULATUS* (Dumeril's Madagascar Spiny-tailed Iguana). PREY AND PREDATORY BEHAVIOR.** Members of the Old World family Opluridae are known to be mainly insectivorous but occasionally include vertebrates and plant materials in their diet (Brillet 1982. Revue d'Ecologie - la Terre et la Vie 36:79–148; Delheusy and Bels 1992. J. Exp. Biol. 170:155–186; Mori and Randriamahazo 2002. Afr. J. Ecol. 40:61–64; Cadle 2003. *In* Goodman and Benstead [eds.], The Natural History of Madagascar, pp. 983–986. Univ. Chicago Press, Chicago, Illinois; Randriamahazo and Mori 2012. Curr. Herpetol. 31:8–13). Specific prey species for the rupicolous species *Oplurus quadrimaculatus* are relatively unknown. Herein, a case of predation on *Palpares amitinus* by *O. quadrimaculatus* is described.

On 14 December 2007, Isalo National Park in the Ihorombe region of Madagascar was visited, which is home to both *O. cuvieri* and *O. quadrimaculatus*. These lizards can be approached and observed from fairly close distances. At 1145 h, the foraging behavior of an adult male *O. quadrimaculatus* was observed. *Palpares amitinus* is an endemic but rather widespread and common species of ant lion in Southern Madagascar. The movement of an airborne adult ant lion caught the lizard's attention at which time it ran after the insect and jumped at it with its mouth open. Only at the third jump was the ant lion grabbed successfully, after which it was eaten whole. Jumps ranged approximately 20–45 cm vertically and 50–100 cm horizontally.

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***PHRYNOSOMA CORNUTUM* (Texas Horned Lizard). MALE-MALE INTERACTIONS.** Male-male interactions in *Phrynosoma* are generally fleeting and aggressive, frequently characterized by head-bobbing, pushups, and reciprocal vent sniffing, followed by the individuals moving away from one another (Whitford and Whitford 1973. Herpetologica 29:191–192; Whitford and Bryant 1979. Ecology 60:686–694; Tollestrup 1981. Herpetologica 37:130–141). Few studies have reported overlap of home ranges (Munger 1984. Oecologia 62: 351–360). Here we report on two adult males who maintained close association over a period of three days.

At 0915 h on 11 July 2013, while conducting a daily resight on a radio-tagged male (SVL = 63 mm) in central Texas, USA (30.579634°N, 99.466518°W; datum WGS84), we encountered and marked a previously untagged adult male (SVL = 60 mm) located approximately 0.5 m away. At 1220 h on 12 July 2013, we returned to the area to resight the individuals. Both were buried in parallel beneath the same Narrow-leaf Yucca plant (*Yucca reverchonii*, Fig. 1). At 1445 h on 13 July 2014, both were again buried beneath the same yucca plant, but their directions had changed and the individuals were now buried facing opposite directions. By 1803 h on 14 July 2013, both individuals were buried greater than 5 m from each other. These observations indicate that male

FIG. 1. Two tagged male *Phrynosoma cornutum* buried in parallel.

P. cornutum may be more tolerant of other males, at least under some circumstances, than previously suggested.

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***PTYCHOGLOSSUS FESTAE* (Peracca's Largescale Lizard). NESTING.** *Ptychoglossus festae* is an uncommon gymnophthalmid lizard distributed from eastern Panama to northwestern Colombia. It occurs in forest leaf litter in areas of lowland tropical rainforest throughout the departments of Chocó, Córdoba, and Antioquia in Colombia, at 30–820 m elevation. Little else is known of the natural history of this species (Harris 1994. Herpetol. Monogr. 8:226–275). Here we report communal egg-laying in *P. festae* within a rotten log in tropical rainforest in the Nature Reserve Civil Society Ormuz, Vereda Las Parcelas Capitán, Corregimiento of Titumate, municipality of Unguia, department of Chocó, Colombia (8.266199°N, 77.089885°W; datum WGS 84) in an area studied from 14–25 September 2013.

At the study site, we found two nests very close to one another, each clutch containing two viable eggs. All eggs were at nearly the same state of development, as all hatched between one to three days following their collection. In addition, a gravid female *P. festae* was found about to lay two eggs next to the other nests. The four eggs weighed on average 0.5 g (range = 0.4–0.6 g), average width 7.33 mm (range = 6.70–8.00 mm), average length 11.14 mm (range = 10.70–11.60 mm). We measured the four neonates, as follows: average LRC 22.86 mm (range = 22.04–23.20 mm), average LC 28.8 mm (range = 26.4–29.10 mm), and average weight 0.30 g (range = 0.28–0.33 g).

This is the first report for conspecific communal oviposition of *P. festae* (Fig. 1). In lizards, communal nests have been observed in various families, including the Gymnophthalmidae (Magnusson and Lima 1984. J. Herpetol. 18:73–75; Radder and Shine 2007. J. Anim. Ecol. 76:881– 887; Doody 2009. Q. Rev. Biol. 84[3]:229–252; Medina-Rangel 2013. Herpetol. Rev. 44:312–313). Although communal oviposition in reptiles has been attributed to scarcity of nest sites offering suitable incubation conditions (direct fitness benefits accruing from the proximity of other eggs; Radder and Shine, *op. cit.*; Doody, *op. cit.*), the tropical rainforest habitat discussed herein provides abundant nesting sites. As affirmed by Doody (*op. cit.*), communal nesting behavior may provide an evolutionary advantage to reptiles, given the lack of parental care in most species, despite the abundance of adequate nest sites. The reproductive aspect of Colombian Gymnophthalmidae is poorly known and information on nests, oviposition, incubation period, and hatchlings is lacking. This report provides the first data on communal nesting for *Ptychoglossus* species in Colombia.

FIG. 1. Eggs at different stages of development and one newly hatched young of *Ptychoglossus festae* observed at a communal oviposition site within a rotten log in Colombia.

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***PYGOPUS NIGRICEPS* (Western Hooded Scaly-foot). TAIL AUTOTOMY.** Some lizards autotomize their tails in response to predatory attacks. Although considerable study has been devoted to understanding the evolution of voluntary tail loss, especially in skinks and geckos (Arnold 1984. J. Nat. Hist. 18:127–169), variation in the "behavior" of the tail among species has not been quantified within a comparative context, at least partly because we lack autotomy observations in nature for a large number of species. Autotomy observations on additional species would thus facilitate our understanding of the phenomenon. Herein we report on an observation of unusual and possibly unique tail autotomy behavior in *Pygopus nigriceps* from tropical Australia.

At ~1900 h on 15 December 2008, while driving along the main highway near Uluru (Ayers Rock), Northern Territory, Australia (25.370503°S, 131.086223°E), we stopped for a lizard that was squirming about on the road. Upon inspection we determined that the lizard was *P. nigriceps*, and had just been run over by a vehicle (one had just sped past us). The lizard appeared to be dead (wounds to the body) but the action of the tail, which had broken from the body but was still connected to it by a small piece of skin, was pulling the body around. At this time, curious about how the tail would move without the lizard, we freed the tail from the body by removing the connecting skin. To our surprise, the tail began to move in a deliberate sinuous fashion like a snake (or legless lizard) away from the body; the anterior end of the tail was raised somewhat, giving the appearance of a head. Remarkably, the tail moved > 3 m from the body, off the road. The path of the tail did not track in a straight line, but also in a somewhat sinuous fashion. After about four minutes, the tail stopped moving horizontally, but continued to wiggle in place, in a back and forth fashion. After about another minute the tail ceased to move, coming to rest on the road shoulder. The body did not move again. The weather was overcast and warm (~25°C); however, a shower had passed through the area that evening, and storms had been present the previous few days.

The tail autotomy we observed in *P. nigriceps* was unusual and possibly unique. Most observations of tail autonomy in lizards involve somewhat random movement patterns within a small area (e.g., within 0.5 m^2, pers. obs.). The tail of the *P. nigriceps*, in sharp contrast, moved well away from the body in a very deliberate fashion, coming to rest meters away. The movement of the tail was reminiscent of a legless lizard or snake, and the pathway would serve to lead the predator well away from the lizard. In our case, we could not observe behavior in the (dead)

lizard as the tail moved away, but future observations should note if the lizard moves in the opposite direction to that of the tail. Further observations are needed to confirm this unusual autotomy in *P. nigriceps*, in congeners, and in other similarly-built pygopodids.

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***SALTUARIUS SWAINI* (Southern Leaf-tailed Gecko). TAIL AUTOTOMY.** Some lizards autotomize their tails in defense of predators, and considerable study has been devoted to understanding the evolution of voluntary tail loss, especially in skinks and geckos (Arnold 1984. J. Nat. Hist. 18:127–169). Variation in the "behavior" of the tail among species has not been quantified within a comparative context, at least partly because we lack autotomy observations for a large number of species (Higham and Russell 2010. Biol. Lett. 6:70–73). Observations for more species are needed to facilitate our understanding of how autotomy is used and how it evolves. Herein we report on an observation of unusual and possibly unique tail autotomy behavior in *Saltuarius swaini*. The tail of *S. swaini* is flat and shaped somewhat like an upside-down tear, with a distinct attenuated tip (Fig. 1).

On 7 May 2001 one of us (SD) inadvertently dislodged the tail from an adult male *S. swaini* while removing the lizard from the road at O'Reilly's Resort in Lamington National Park, Queensland, Australia (28.229462°S, 153.133309°E). The (entire) autotomized tail dropped onto the road and immediately exhibited unusual locomotion for an autotomized tail. The tail, which was an original tail based on the presence of spines (as in Fig. 1), flipped sideways in one direction repeatedly, resulting in an overall rolling action that tracked in a large circle with a diameter of approximately 0.5 m. After about two minutes, movement of the tail slowed considerably, during which time SD noticed that the tail tip was the lever that flipped the tail. At this time SD quickly removed the tip of the tail with a knife, and this caused the tail to cease flipping and thus rolling. The tip-less tail rocked back and forth in place for another minute or so before it ceased movement altogether. The time was 2030 h on a misty night with an air temperature of 18°C.

PHOTOS BY S. MACDONALD

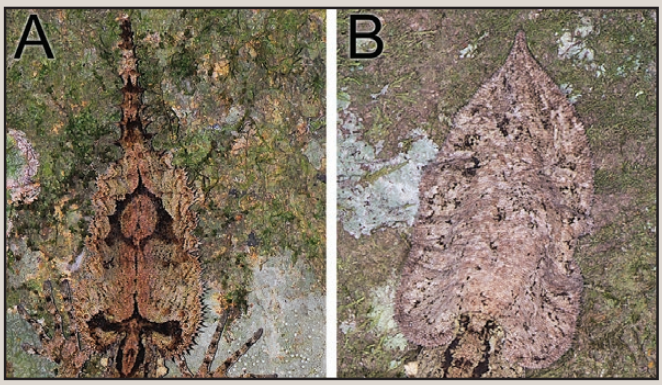

FIG. 1. *Saltuarius swaini*, showing the shape of the (A) original tail and (B) regenerated tail. During autotomy in the original tail, the tip of the tail acts as a lever to continuously flip the autotomized tail in one direction, resulting in the tail 'rolling' in a circular path well away from the body.

The tail autotomy SD observed in *S. swaini* is apparently unique. The flat shape of the tail, along with the tip as a lever, resulted in the tail moving non-randomly over a considerable area, compared to the more usual movements of autotomized lizard tails that generally move rapidly and somewhat randomly within a smaller area (pers. obs.). Although tail autotomy is presumed to have evolved to distract the would-be predator from the lizard, non-random tracking of the tail of *S. swaini* would seemingly provide a more deliberate path away from the lizard. Tests of the lizard's movements immediately following autotomy would be invaluable here. Moreover, the use of the tail-tip as a lever, coupled with little tail movement when the tip was removed, indicates that the tail tip may have evolved explicitly to serve an antipredator function. Comparative study of closely related members of the group with variation in tail shape and tip length could confirm the importance of the tail tip for autotomy in *S. swaini*, as well as determine how autotomy has been modified in this group of arboreal geckos. Also, the regenerated tails in this species exhibits a shorter tail tip, which may influence the behavior of the autotomized tail.

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***SCELOPORUS NELSONI* (Nelson's Spiny Lizard). CESTODE ENDOPARASITES.** *Sceloporus nelsoni* ranges from southwest Chihuahua and southern Sonora, Mexico along Pacific slopes to Jalisco, Mexico (Lemos Espinal and Smith 2007. Amphibians and Reptiles of the State of Chihuahua, Mexico. Comisión Nacional Para Conocimiento y Uso de la Biodiversidad, Universidad Nacional Autónoma de Mexico, Tlalnepantl, edo. de México. 613 pp.). Currently, there are two helminth species known from *S. nelsoni*: *Parapharyngodon alvarengai* and *Strongyluris similis* (Mayén-Peña et al. 1998. J. Helminthol. Soc. Washington 65:108–111). The purpose of this note is to add to the helminth list of *S. nelsoni*.

A sample of 11 *S. nelsoni* (mean SVL = 54.6 mm ± 3.7 SD, range = 44–58 mm) collected in the vicinity of Alamos (27.00275°N, 108.9400°W), Sonora, Mexico in 1960 to 1963, 1966, 1975 and deposited in the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA was examined for helminths (LACM) 96211, 96216, 96218, 96225, 96226, 96229, 96232, 96234, 96235, 96240, 96241.

The body cavity was opened and the digestive tract removed, opened by a longitudinal incision and examined under a dissecting microscope. Only cestodes (from the small intestines of LACM 96218, 96240, 96241) were found, which were regressively stained in hematoxylin, mounted in Canada balsam, studied using a compound microscope and identified as *Oochoristica scelopori* (prevalence: number infected/number examined × 100 = 27%, mean intensity: mean number infected individuals ± 2.7 SD, range = 1–6). The finding of only one helminth species in *S. nelsoni* may reflect our small sample size. Voucher cestodes were deposited in the helminthological collection of the United States Parasite Collection (USNPC), Beltsville, Maryland, USA as *Oochoristica scelopori* USNPC (107888).

Oochoristica scelopori is common in sceloporine lizards from both Arizona (Goldberg et al. 1994. J. Helminthol. Soc. Washington 61:73–83) and Mexico (Goldberg et al. 2003. Southwest. Nat. 48:208–217) as well as other lizards from southern California

(Telford 1970. Amer. Midl. Nat. 83:516–554). Our diagnosis of *O. scelopori* is based on characters of Nearctic species of *Oochoristica* as listed in Table 2 of Bursey et al. (2010. Zootaxa 2715:45–54): neck present; circular suckers; 22–43 testes present in one cluster; ovary with large number of lobules. *Sceloporus nelsoni* represents a new host record for *Oochoristica scelopori*.

We thank G. Pauly (LACM) for permission to examine *S. nelsoni*.

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***SCELOPORUS OCCIDENTALIS* (Western Fence Lizard) and *SCELOPORUS ORCUTTI* (Granite Spiny Lizard). FEEDING BEHAVIOR AND DIET.** On 17 April 2010 between 1115–1145 h, we observed five *Sceloporus occidentalis* and three *S. orcutti* preying on carpenter ants (*Camponotus*) approx. 6 km NW of Warner Springs, San Diego Co., California, USA (33.30502°N, 116.69444°W, datum WGS84; elev. 890 m). The *Camponotus* were emerging from their nest and swarming the surface of a granite boulder approximately 3 m diameter. The swarm (> 1000) covered approximately 75% of the boulder and consisted of an estimated 85% workers (sterile wingless females) and 15% winged queens and males. The ants are currently being described as a new species of *Camponotus* (P. Ward, pers. comm.).

Both *Sceloporus* species were employing ambush foraging behavior. The lizards were positioned on elevated ambush sites on the edge of an adjacent boulder in clear view of the ants. Occasionally a lizard would jump about 10 cm across a crevice to the adjacent boulder, run among the carpenter ants, capture a single ant, and then quickly retreat to its elevated perch to consume its prey. *Camponotus* are large, fiercely territorial ants. They do not sting, but the workers and soldiers can administer a powerful bite that is often accompanied by the release of formic acid (Hölldobler and Wilson 1990. The Ants. The Belknap Press of Harvard University Press, Cambridge, Massachusetts. 732 pp.). One male *S. occidentalis* (SVL = 75 mm) was collected (SDNHM 68935). Its stomach contents contained several *Camponotus* sp. (*sensu* Ward, *op. cit.*) consisting of one alate queen, two workers and ant fragments; one *Dermacentor occidentalis* (Arachnidae: Ixodidae); an unidentified Coleoptera, and an unidentified Hemiptera.

Jumping to catch insect prey by *Sceloporus occidentalis* (Stone 1942. Copeia 1942:129) and ants as prey for both *S. occidentalis* and *S. orcutti* has been previously reported (Mayhew 1963. Amer. Midl. Nat. 69:310–327; Johnson 1965. Herpetologica 21:114–117; Clark 1973. Herpetologica 29:73–75; Otvos 1977. Herpetol. Rev. 8:6–7). This is the first report of these species consuming *Camponotus*. The feeding behavior described demonstrates an ability to successfully and repeatedly capture and consume potentially harmful prey while minimizing injury. Our observation of the aggregation of feeding in syntopic *S. occidentalis* and *S. orcutti* from the same outcrop suggests that the lizards temporarily suspend interspecific territoriality (Creusere and Whitford 1982. *In* Scott [ed.], Herpetological Communities, pp. 121–127. U.S. Dept. Interior, Fish and Wildlife Service, Research Report 13) to take advantage of an abundant food supply.

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***SCELOPORUS OMILTEMANUS* (Southern Cleft Lizard). ENDOPARASITES.** *Sceloporus omiltemanus* is restricted to Guerrero and Oaxaca, Mexico (Martínez-Méndez and Méndez-De La Cruz 2007. Zootaxa 1609:53–68; Uetz and Hosek [eds.] 2014. The Reptile Database, http://www.reptile-database.org, accessed 03 February 2014). We know of no published reports of helminths for *S. omiltemanus*. The purpose of this note is to establish the initial helminth list for *S. omiltemanus*.

Four *S. omiltemanus* (mean SVL = 87.0 mm ± 12.7 SD, range = 72–98 mm) were examined from the herpetology collection of the Los Angeles County Museum of Natural History (LACM) collected 1973 (LACM 109214) and 1977 (LACM 127038–127040). Specimens were from the vicinity of Carrizal de Bravo (17.621111°N, 99.838056°W, elev. 2400 m), Guerrero, Mexico.

The body cavity was opened and the digestive tract was removed, opened by a longitudinal incision and examined under a dissecting microscope. Cestodes were regressively stained in hematoxylin, mounted in Canada balsam, and studied using a compound microscope. Nematodes were cleared in a drop of lactophenol on a glass slide, cover slipped and studied under a compound microscope. Found were one species of Cestoda: *Oochoristica scelopori* (infection site, small intestine), helminths (N) = 8, prevalence = number infected/number examined × 100 = 50%, mean intensity ± SD, mean number infected individuals with range = 4.0 ± 8.5 SD, range = 1–7, and four species of Nematoda: *Spauligodon giganticus* (large intestine, (N) = 13, prevalence = 100%, mean intensity = 8.5 ± 3.1 SD, 6–13; *Strongyluris similis* (large intestine, (N) = 39, prevalence = 75%, mean intensity ± SD = 13.0 ± 11.8, 3–26; *Oswaldocruzia* sp. (stomach, small intestine), (N) = 5, prevalence = 25%, and *Physocephalus* sp. (stomach wall), (N) = 5, prevalence = 25%. Voucher helminths were deposited in the United States National Parasite Collection (USNPC), Beltsville, Maryland as: *Oochoristica scelopori* (USNPC 107891), *Spauligodon giganticus* (USNPC 107893), *Strongyluris similus* (USNPC 107894), *Oswaldocruzia* sp. (USNPC 107895), *Physocephalus* sp. (USNPC 107897).

Oochoristica scelopori is common in sceloporine lizards from both Arizona (Goldberg et al. 1994. J. Helminthol. Soc. Washington 61:73–83) and Mexico (Goldberg et al. 2003. Southwest. Nat. 48:208–217) as well as other lizards from southern California (Telford 1970. Amer. Midl. Nat. 83:516–554). Our diagnosis of *O. scelopori* is based on characters of Nearctic species of *Oochoristica* listed in Table 2 of Bursey et al. (2010. Zootaxa 2715:45–54): neck present, circular suckers, 22–43 testes present in one cluster, ovary with large number of lobules. *Spauligodon giganticus* is distinguished from *S. oxkutzcabiensis* which also occurs in Mexican sceloporines (Goldberg et al. 2003. Southwest. Nat. 48:208–217) on the basis of egg morphology: eggs of *S. giganticus* are lanceolate with a knob at the wide end; eggs of *S. oxkutzcabiensis* are lanceolate with a knob at each end (Bursey et al., 2005. J. Parasitol. 91:324–328. *Strongyluris similis* has been previously reported from sceloporines from both Mexico and the United States (Goldberg et al. 2003, *op. cit.*). Species of *Oswaldocruzia* sp. are found worldwide in the intestines of amphibians and reptiles (Anderson 2000. Nematode Parasites of Vertebrates Their Development and Transmission. CABI Publishing, Oxon, UK. 650 pp.). Larvae of *Physocephalus* were previously reported from

cysts in the stomach walls of Mexican sceloporines (Goldberg et al. 2003, *op. cit.*). As no further development occurs, lizards probably serve as paratenic (transport) hosts for larvae of *Physocephalus* sp. *Sceloporus omiltemanus* represents a new host record for *O. scelopori, S. giganticus, S. similis, Oswaldocruzia* sp., *Physocephalus* sp.

We thank G. Pauly (LACM) for permission to examine *S. omiltemanus*.

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***SCELOPORUS PARVUS* (Blue-bellied Lizard). FEMALE AGGRESSION.** Aggressive displays are used by lizards in the genus *Sceloporus* for social communication (e.g., Carpenter 1978. Contrib. Biol. Geol. Milwaukee Publ. Mus. 18:1–71). Previous studies of aggressive signaling have focused mostly on males, but some female *Sceloporus* use aggressive displays in social interactions (Woodley and Moore 1999. Horm. Behav. 35:205–214; Hews et al. 2004. Anim. Behav. 68:1201–1207). Here, I provide what I believe to be the first reported observations of aggressive signaling by female *Sceloporus parvus*. Both observations were made in the breeding season on a population of *S. parvus* located ca. 10 km W of San Joaquín, Querétaro, Mexico (20.89668°N, 99.65568°W, datum WGS84; 2177 m elev.).

On 31 May 2013 I observed a male *S. parvus* basking on a boulder. The lizard abruptly moved to the ground on the opposite side of the boulder and was out of view for ca. 10 sec. When I relocated the focal male, I observed him consuming an unidentified grasshopper with the head protruding from the lizard's mouth. A female *S. parvus* quickly approached the male from ca. 1 m away in a series of three short-distance movements. Each movement was made directly toward the male and interrupted by a bout of 2–3 push-up displays by the female. The push-up displays involved movement of the front two legs with slight dorsolateral compression, a posture typically seen in aggressive interactions of *Sceloporus*. When the female was ca. 15 cm from the male, he retreated beneath the boulder with the partially consumed grasshopper and was followed rapidly by the female.

On 1 June 2013 I observed a *S. parvus* female basking on a rock when a male approached from ca. 4 m away while performing shudder courtship displays. When the male was ca. 2 m away from the female, she turned laterally to present her left side to the male, arched her back, and compressed her body dorsolaterally. Similar postures have been described as courtship rejection displays in other lizards (Cooper and Greenberg 1992. *In* Gans and Crews [eds.], Hormones, Brain, and Behavior, Biology of the Reptilia Vol. 18, Physiology E, pp. 298–422. University of Chicago Press, Chicago, Illinois). When the female assumed the posture, the male terminated a shudder display and moved away from the female. The female remained in the aggressive posture until the male entered a shrub ca. 1.5 m away.

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***SCELOPORUS PARVUS* (Blue-bellied Lizard). REPRODUCTION.** *Sceloporus parvus* is known from the Sierra Madre Oriental of northeastern México; recorded from the highlands of Coahuila, Nuevo León, Tamaulipas, San Luis Potosí, and Hidalgo (Lemos Espinal and Smith 2007. Amphibians and Reptiles of the State of Coahuila. CONABIO/UNAM. 550 pp.). The natural history of this species is poorly understood and no data on reproduction are available. Lemos Espinal and Smith (2007, *op. cit.*) comment that this species is probably oviparous.

On 6 April 2012, one gravid female *S. parvus* (MZFC 29625; Colección Herpetológica del Museo de Zoología Alfonso L. Herrera Facultad de Ciencias UNAM) was collected in oak forest habitat at the Rancho el Chupadero, Municipality Ocampo, Coahuila, México (27.1655°N, 102.5722°W, datum WGS84; 2012 m elev.). The female measured 44.7 mm SVL, body mass was 12.3 g. The female contained a clutch size of 3 eggs: egg mass 0.24–0.28 g (mean = 0.26); egg length 9.38–9.65 mm (mean = 9.52). This information confirms the oviparity of the species and represents the first clutch size reported for *S. parvus*.

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***SCELOPORUS SINIFERUS* (Longtail Spiny Lizard). ENDOPARASITES.** *Sceloporus siniferus* occurs along the Pacific slope of southern Mexico from Guerrero to Guatemala and inland through the states of Morelos, Oaxaca, and Chiapas (Uetz and Hosek [eds.], The Reptile Database, http://www.reptile-database.org, accessed 07 Nov 2013). We know of no helminth records from this species. The purpose of this note is to establish the initial helminth list for *S. siniferus*.

A sample of nine *Sceloporus siniferus* (mean SVL = 51.6 mm ± 4.3 SD, range = 45–49 mm collected in Oaxaca, Mexico during 1957, 1964, and 1965 and deposited in the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA as LACM 61964–61968, 64494–64496, 97412 was examined.

The body cavity was opened and the digestive tract removed, opened by a longitudinal incision and examined under a dissecting microscope. One nematode was found in the stomach of LACM 61965 and two were found in LACM 64494 (one in the stomach, one in the small intestine). Nematodes were cleared in a drop of lactophenol on a glass slide, coverslipped, studied under a compound microscope and identified as *Physaloptera retusa, (*prevalence: number infected/number examined × 100 = 22%) mean intensity: mean number infected individuals ± 1 SD = 1.5 ± 0.70 SD, range = 1, 2).Voucher helminths were deposited in the United States National Parasite Collection (USNPC), Beltsville, Maryland as *Physaloptera retusa* (USNPC 107887). *Physaloptera retusa* has the largest latitudinal geographic range of any Western Hemisphere nematode, occurring in lizards from North, Central and South America (Baker 1987. Synopsis of the Nematoda Parasitic in Amphibians and Reptiles. Mem. Univ. Newfoundland 11:1–325; Bursey et al. 2007. Comp.

Parasitol. 74:108–140). *Sceloporus siniferus* represents a new host record for *Physaloptera retusa*.

We thank G. Pauly (LACM) for permission to examine *S. siniferus*.

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***SCINCELLA LATERALIS* (Little Brown Skink). PREDATION.** *Scincella lateralis* is a small skink native to the southeastern USA, where it is depredated by a variety of snakes, spiders, and predatory birds. Other than shrikes (*Lanius*) and corvids, only a few passerine birds have been documented to depredate *S. lateralis*, including Eastern Meadowlarks (*Sturnella magna*; Kemmerer and Cline 1985. Herpetol. Rev. 16:27–28), and Eastern Bluebirds (*Sialia sialis*; Beane and Trail 1991. Herpetol. Rev. 22:99). On 30 December 2013 at 1330 h, I observed an Eastern Phoebe (*Sayornis phoebe*) eating an adult *S. lateralis* at the Falls Lake Dam in Wake Co., North Carolina, USA (35.939897°N, 78.582787°W, WGS84; eBird checklist http://ebird.org/ebird/view/checklist?subID=S16129770). The bird was shaking the lizard violently in its bill and beating it against the branch it was perched on, consistent with prey-killing behavior used by both shrikes and bluebirds. The skink had lost most of its tail, although it could not be determined whether this happened during this predation event or a previous one. Although two separate accounts document Eastern Phoebes eating small fish (Jung 1926. Bird-Lore 28:63–64; Binford 1957. Auk 74:264–265), this is apparently the first account of one eating a tetrapod vertebrate.

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***SPHENOMORPHUS SCOTOPHILUS* (Spotted Forest Skink). REPRODUCTION.** *Sphenomorphus scotophilus* is scansorial and diurnal and is known from southern Thailand south through Peninsular Malaysia to possibly Sumatra (Grismer 2011a. Field Guide to the Amphibians and Reptiles of the Seribuat Archipelago [Peninsular Malaysia]. Edition Chimaira, Frankfurt am Main. 239 pp.). In the Seribuat Archipelago, gravid females carrying two eggs have been found during March, April, July, and September; hatchlings were observed in November (Grismer 2011b. Lizards of Peninsular Malaysia, Singapore and their Adjacent Archipelagos. Edition Chimaira, Frankfurt am Main. 728 pp.). In this note, we add information on the reproductive biology of *S. scotophilus* from a histological examination of gonadal material.

A sample of 48 *S. scotophilus* from West Malaysia collected 2001 to 2007 by LLG and deposited in the herpetology collection of La Sierra University, Riverside, California, USA was examined. The sample consisted of 29 adult males (mean SVL = 47.4 mm ± 4.7 SD, range = 35–58 mm), 18 adult females (mean SVL = 48.4 mm ± 3.0 SD, range = 44–54 mm), and one juvenile (SVL = 28 mm). *Sphenomorphus scotophilus* were collected in West (Peninsular) Malaysia (by state): Johor (N = 13), Pahang (N = 27), Penang (N = 3), Selangor (N = 5).

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 in LSUHC.

Table 1. Monthly stages in the ovarian cycle of 18 adult female *Sphenomorphus scotophilus* from West Malaysia. *One oviductal female exhibited concurrent yolk deposition.

Month	N	Quiescent	Yolk deposition	Enlarged follicles > 4 mm	Oviductal eggs
March	5	2	0	1	2
July	13	2	2	0	9*

The only stage present in the testicular cycle was spermiogenesis in which the lumina of the seminiferous tubules were lined by sperm or clusters of metamorphosing spermatids. The following monthly samples of males were examined: March (N = 8), June (N = 2), July (N = 12), August (N = 5), September (N = 1), October (N = 1). The smallest reproductively active male (spermiogenesis) measured 35 mm SVL (LSUHC 8199) and was collected in September.

Four stages were present in the ovarian cycle (Table 1): 1) quiescent, no yolk deposition; 2) yolk deposition (basophilic vitellogenic granules in the ooplasm); 3) enlarged follicles > 4 mm; 4) oviductal eggs. One female with oviductal eggs (LSUHC 7278) was undergoing concurrent yolk deposition for a subsequent clutch indicating *S. scotophilus* can produce multiple egg clutches in the same year. Mean clutch size (N = 12) was 1.8 ± 0.39 SD, range = 1–2. The smallest reproductively active female (oviductal eggs) measured 44 mm SVL and was collected in July (LSUHC 4574). One juvenile (LSUHC 4702) of possible neonate size (SVL = 28 mm) was collected in July.

In view of the extended period in which reproductively active males were found and the observations of Grismer (2011b, *op. cit.*), *S. scotophilous* exhibits an extended reproductive cycle, in which breeding may be continuous.

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***XANTUSIA ARIZONAE* (Arizona Night Lizard). REPRODUCTION.** *Xantusia arizonae* is endemic to Arizona west of the Verde River in the Weaver, Date Creek, and McCloud Mountains (Sinclair et al. 2004. Amer. Nat. 163:396–414). The species has been reported to give birth to one or two young in late August (Klauber 1931. Trans. San Diego Soc. Nat. Hist. 7:1–16; Brattstrom 1951. Herpetologica 7:143–144). The purpose of this note is to provide additional information on reproduction of *X. arizonae*.

Eleven *X. arizonae* consisting of one adult male (SVL = 46 mm), one subadult male (SVL = 43 mm), eight adult females (mean SVL = 55.0 mm ± 1.9 SD, range = 53–58 mm), and one unsexed subadult (SVL = 40 mm) in the herpetology collection of the Natural History Museum of Los Angeles County (LACM) were examined for reproductive activity. Eleven were collected in May 1982; one was collected in June 1982, all from the vicinity of Yarnell (34.2225°N, 112.7496°W), Yavapai Co.: LACM 134510–134516, 134524, 134526, 134530, 169268.

Ovaries and testes were histologically examined. Tissues were embedded in paraffin, histological sections were cut at 5

µm and stained with hematoxylin followed by eosin counterstain. Histology slides were deposited in LACM.

One *X. arizonae* male (SVL = 48 mm SVL) was undergoing spermiogenesis; lumina of the seminiferous tubules were lined by sperm or clusters of metamorphosing spermatids. One smaller male (SVL = 43 mm) exhibited early recrudescence in which seminiferous tubules contained 3–4 layers of primary spermatocytes with spermatogonia in the basal layer. It was considered to be a subadult.

Seven of eight females were undergoing yolk deposition with 1–2 follicles containing basophilic granules in the ooplasm. The other *X. arizonae* female (from June) contained two oviductal eggs; no embryos were visible. Mean clutch size for eight females was 1.8 ± 0.46 SD, range = 1–2. The smallest reproductively active females (vitellogenic granules in follicles) measured 53 mm SVL (LACM 134516, 162968).

In conclusion of this investigation, *X. arizonae* belongs to the group of xantusiids which breed in spring with young produced in late summer to early fall, including the congeners *X. riversiana* (Goldberg and Bezy. 1974. Herpetologica 30:350–360), *X. henshawi* (Lee 1975. Trans. San Diego Soc. Nat. Hist. 17:259–278), and *X. vigilis* (Miller 1948. Univ. California Publ. Zool. 47:197–213).

We thank G. Pauly (LACM) for permission to examine *X. arizonae*.

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XANTUSIA BEZYI **(Bezy's Night Lizard). REPRODUCTION.** *Xantusia bezyi* is an Arizona endemic found east of the Verde River from the Mazatzal and Superstition Mountains east to the northwest base of the Pinal Mountains and south across the Gila River to the Galiuro Mountains (Sinclair et al. 2004. Amer. Nat. 163:396–414). The purpose of this note is to provide information on reproduction of *X. bezyi*.

Twenty-one *X. bezyi* consisting of seven adult males (mean SVL = 50 mm ± 2.4 SD, range = 48–53 mm), 11 adult females (mean SVL = 55 mm ± 4.1 SD, range = 48–63 mm), and three subadult males (mean SVL = 41 mm ± 1.0 SD, range = 40–43 mm in the herpetology collection of the Natural History Museum of Los Angeles County (LACM) were examined for reproductive activity. All were collected May 1982 from Maricopa County (LACM 134498, 134500, 134503, 134504, 134506) and Pinal County (LACM 134478–134480, 134483–134489, 134491–134493, 134495–134497).

Ovaries and testes were histologically examined. Tissues were embedded in paraffin, histological sections were cut at 5 µm and stained with hematoxylin followed by eosin counterstain. Histology slides were deposited in LACM.

Xantusia bezyi males larger than 48 mm SVL were undergoing spermiogenesis (lumina of the seminiferous tubules are lined by sperm or metamorphosing spermatids). Three smaller males measuring 40 mm (LACM 134996), 41 mm (LACM 134497) and 42 mm SVL (LACM 134495), all from May, exhibited early recrudescence (seminiferous tubules contain ca. 4 layers of spermatogonia and primary spermatocytes) and were considered to be subadults.

Seven of eleven females were undergoing yolk deposition (basophilic yolk granules in the ooplasm) for a litter of 1–2 (mean litter size = 1.6 ± 0.53) that likely would have been produced in the fall. The smallest reproductively active female (LACM 134488) measured 53 mm SVL and contained two yolking follicles, As is typical for other xantusiid lizards (Goldberg and Bezy 1974. Herpetologica 30:350–360; Goldberg 2013. Sonoran Herpetol. 26:9–11), not all mature females reproduce each year. Thus, LACM 134056 (SVL = 48 mm), collected in May could have been a mature female that was not breeding.

In conclusion of this investigation, *X. bezyi* is a spring breeder with one to two young produced likely in early fall. Timing of events in the reproductive cycle of *X. bezyi* appear to be similar to the congeners *X. riversiana* (Goldberg and Bezy 1974, *op. cit.*), *X. henshawi* (Lee 1975. Trans. San Diego Soc. Nat. Hist. 17:259–278; Goldberg 2013, *op. cit.*), and *X. vigilis* (Miller 1948. Univ. California Publ. Zool. 47:197–213; Zweifel and Lowe 1966. Am. Mus. Novitat. 2247:1–57).

We thank G. Pauly (LACM) for permission to examine *X. bezyi*.

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XANTUSIA BOLSONAE **(Bolsón Night Lizard). REPRODUCTION.** *Xantusia bolsonae* is known from two localities in the southern Chihuahuan Desert of Durango, Mexico (Webb 1970. Contrib. Sci. 194:1–10; Flores-Villela et al. 1990. Herpetol. Rev. 21:97). In this note we provide information on the timing of female *X. bolsonae* reproduction.

Eight *X. bolsonae* consisting of six adult females, mean SVL = 53.3 mm ± 3.0 SD, range = 48–57 mm, one sub-adult of indeterminate sex, SVL = 34 mm, and one neonate, SVL = 28 mm, in the herpetology collection of the Natural History Museum of Los Angeles County (LACM) were examined for reproductive activity: LACM 116260, 136791, 136792 (May 1975); LACM 76156, 76158, 76159 (September 1971); LACM 106805, 106806 (September 1972); all from the vicinity of Pedriceña, Durango, Mexico.

The specimens (except for the neonate) previously had been opened for the purposes of karyotypic study. Ovaries from the three September females were histologically examined. Tissues were embedded in paraffin, histological sections were cut at 5 µm and stained with hematoxylin followed by eosin counterstain. Histology slides were deposited in LACM. No histology was done on the embryos.

Two females from May contained developing embryos with visible eyes, LACM 136791 (SVL = 57 mm) and LACM 136792 (SVL = 53 mm). LACM 116260 from May (SVL = 55 mm) contained one oviductal egg with no embryo visible. We arbitrarily considered LACM 106805 (SVL = 48 mm) from September as an adult, although we could not determine if parturition had occurred. All September females contained quiescent ovaries with no yolk deposition in progress.

In summary, the presence of well-developed embryos in *X. bolsonae* in May suggests that young are born in late spring to early summer. Thus, the female reproductive cycle of *X. bolsonae* approximates that of the sympatric *X. extorris* (Webb 1965. Amer. Mus. Novitat. 2231:1–16), to which molecular data suggest it is closely related (Noonan et al. 2013. Mol. Phylogen. Evol. 69:109–122) and differs from that of the morphologically similar *X. henshawi* in which parturition occurs in September to October (Lee 1975. Trans. San Diego Soc. Nat. Hist. 17:259–278; Goldberg 2013. Sonoran Herpetol. 26:9–11).

We thank G. Pauly (LACM) for permission to examine *X. bolsonae*.

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***XANTUSIA EXTORRIS* (Durango Night Lizard). REPRODUCTION.** *Xantusia extorris* was described from Durango, Mexico by Webb (1965. Amer. Mus. Novitat. 2231:1–16). It is currently known from Durango and Zacatecas (Baker et al 1981. Southwest. Nat. 25:568–569). Webb (*op. cit.)* reported one or two embryos were present in all females > 38 mm from May and estimated that offspring are born in late May or early June. The purpose of this note is to provide additional information on the timing of events in the *X. extorris* reproductive cycle.

Sixteen females (mean SVL = 37.5 mm ± 2.1 SD, range = 33–42 mm) and six males (SVL = 34.8 mm ± 1.7 SD, range = 33–38 mm) of *X. extorris* from the herpetology collections of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA and the University of Arizona (UAZ), Tucson, Arizona, USA from Durango, Mexico, vicinity of Pedricena (25.1000°N, 103.7833°W, 1325 m elevation) were borrowed: LACM:106802, 116263, 116265–116268; UAZ: 17404, 17405, 17408, 17570, 17563, 17564, 17568, 17569, 17572–17576, 17580–17582. The specimens were collected 1965 to 1975.

Testes were histologically examined. Tissues were embedded in paraffin, histological sections were cut at 5µm and stained with hematoxylin followed by eosin counterstain. Histology slides were deposited in LACM and UAZ.

All six males contained regressed testes in which the seminiferous tubules were very small and contained primarily spermatogonia. It is possible they were all subadults.

Mean litter size for fifteen females with oviductal eggs from April to May was 1.4 ± 0.51 SD, range = 1–2. One female (LACM 116267, SVL = 33 mm) from May contained quiescent ovaries (no yolk deposition) and was either a subadult or an adult that was not breeding. The smallest reproductively active female (UAZ 17581) measured 34 mm SVL, was collected during April and contained one oviductal egg. This is a new minimum size for reproductive activity in *X. extorris* females; Webb (*op. cit.*) reported the smallest gravid female measured 38 mm SVL. An embryo was externally visible in one oviductile female from May (LACM 116268). No eggs were dissected to ascertain the presence of embryos.

In summary, the presence of an embryo and oviductal eggs in female *X. extorris* from April and May suggests that young are born in late spring to early summer confirming the observations of Webb (*op. cit.*). The presence of regressed testes in males from April and May differs strikingly from the reproductive cycle of the spring breeding *X. vigilis* (Miller 1948. Univ. California Publ. Zool. 47:197–213) and is suggestive that *X. extorris* may breed in fall or winter. Our data indicate the timing of events in the reproductive cycles of *X. extorris* and *X. bolsonae* (Goldberg and Bezy 2014. Herpetol. Rev. 45:509–510) are similar. Moreover, molecular data (Noonan et al. Mol. Phylogen. Evol. 69:109–122) suggest these two species are closely related.

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***XANTUSIA WIGGINSI* (Wiggins' Night Lizard). REPRODUCTION.** *Xantusia wigginsi* is found from southern California through Baja California to northern Baja California Sur (Sinclair et al. 2004. Amer. Nat. 163:396–414; Leavitt et al. 2007. Mol. Ecol. 16:4455–4481; Backlin and Fisher 2011. Herpetol. Rev. 42:392). We present the first information on litter size and the timing of events in the reproductive cycle of the species.

Nineteen *X. wigginsi* consisting of three adult males (mean SVL = 34 mm ± 2.0 SD, range = 32–36 mm); thirteen adult females (mean SVL = 36.6 mm ± 2.6 SD, range = 34–43 mm), one subadult male (SVL = 31.0 mm SVL) and two subadult females (SVL = 33.0 mm) in the herpetology collection of the Natural History Museum of Los Angeles County (LACM) were examined from localities between 27.59°N and 31.33°N in Baja California (LACM 3761, 26142, 36569, 62245, 101211, 101213–01224, 101330) and Baja California Sur (LACM 126139). The specimens had been collected between 1954 and 1977.

Ovaries and testes were histologically examined. Tissues were embedded in paraffin, histological sections were cut at 5 µm and stained with hematoxylin followed by eosin counterstain. Histology slides are deposited in LACM.

Two males from May were undergoing sperm formation (spermiogenesis) in which the lumina of the seminiferous tubules were lined by sperm or clusters of metamorphosing spermatids. One male from June was undergoing late spermiogenesis in which the number of cell layers in the germinal epithelium was reduced. The smallest reproductively active male (spermiogenesis) measured 32 mm SVL (LACM 36569) and was from May. One male (LACM 101221) from April (SVL = 31 mm) exhibited testicular recrudescence (proliferation of germ cells for the next period of spermiogenesis). It was classified as a juvenile as it is not known when spermiogenesis would have commenced,

Four stages were observed in the ovarian cycle: 1) quiescent, no yolk deposition; 2) early yolk deposition (vitellogenic granules) in ooplasm; 3) enlarged ovarian follicles (> 4 mm); 4) embryo present (Table 1). Litter size for five females was 1.0 for each. The two smallest reproductively active females (early yolk deposition) each measured 34 mm SVL (LACM 101211, 101225) and were from April. Two April females (each 33 mm SVL) exhibited quiescent ovaries (LACM 101217, 101220) and were classified as juveniles.

In summary, *X. wigginsi* is a spring breeder with young produced in early fall. Timing of events in the reproductive cycle appears similar to *X. riversiana* (Goldberg and Bezy 1974. Herpetologica 30:350–360; *X. henshawi* (Lee 1975. Trans. San Diego Soc. Nat. Hist. 17:259–278; Goldberg 2013. Sonoran Herpetol. 26:9–11) and *X. vigilis* (Miller 1948. Univ. California Publ. Zool. 47:197–213; Zweifel and Lowe 1966. Am. Mus. Novitat. 2247:1–57). Although the sample is limited, *X. wigginsi* may have the smallest litter size (1.0) in the genus.

TABLE 1. Monthly stages in the ovarian cycle of 13 *Xantusia wigginsi.*

Month	N	Quiescent	Early yolk deposition	Enlarged follicles > 4 mm	Embyros
March	1	1	0	0	0
April	9	2	5	2	0
June	2	0	0	2	0
August	1	0	0	0	1

We thank G. Pauly (LACM) for permission to examine *X. wigginsi*.

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***ZOOTOCA VIVIPARA* (Common Lizard). ABNORMAL ACTIVITY.** An activity period of *Zootoca vivipara* in St. Petersburg, Russia region spans about five and a half months. This cold-tolerant species is active from mid-April to late September–early October. The earliest record of spring activity within the St. Petersburg region is 3 April, latest autumn record on surface is 11 October. Populations of this species inhabit slopes of Pulkovo Heights that are covered partly by agriculture and partly by secondary mixed forest.

November of 2013 in St. Petersburg was unusually warm. The average monthly temperature at 2 m above ground was 4.2°C. During two weeks of observations the average daily air temperature was 4.9°C; minimum value 0.0°C; maximum value 8.2°C for period 10–24 November 2013. Maximum air temperature for this period was registered on 17 November (http://rp5.ru/).

On 17 November during a visit to the Pulkovo Heights, St. Petersburg, Russia (59.7722355°N, 30.3190041°E), I found one freshly killed adult male *Z. vivipara* out of its winter burrow. The dead lizard was found on the road along a garden on the western slope near habitat typically used by this lizard. The lizard (now stored in Zoological Institute, ZISP 27409) had been very recently killed on the road by vehicle. On this date the air temperature reached 8.2°C, humidity 53–83%, wind NW, wind speed 7 m/c, cloud coverage 70–80%, stratocumulus.

This unprecedented record of atypical activity in this species can be explained by the abnormally warm autumn season in 2013 in eastern Europe.

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SQUAMATA — SNAKES

***AGKISTRODON PISCIVORUS* (Cottonmouth). DIET.** *Agkistrodon piscivorus* is an abundant semiaquatic pitviper endemic to the southeastern United States. While *A. piscivorus* is a highly generalized opportunist that preys upon a wide variety of taxa, fish and amphibians are the most frequent prey (Ernst and Ernst 2003. Snakes of the United States and Canada, Smithsonian Books, Washington, DC. 668 pp.). On 30 June 2013, at approx. 1500 h, we collected a juvenile *A. piscivorus* along the bank of Pond Creek, Conecuh National Forest, Covington Co., Alabama, USA (31.09768°N, 86.53458°W; datum WGS84). The snake's body was distended due to a large prey item. After manual palpation, the snake regurgitated the remains of an adult *Lithobates grylio* (Pig Frog). The frog was identifiable but in an advanced stage of digestion, so no attempt was made to collect it. *Agkistrodon piscivorus* is a known predator of *Lithobates* species, including *L. catesbeianus, L. clamitans, L. palustris,* and *L. sphenocephalus* (Ernst and Ernst, *op. cit.*). However, to our knowledge this represents the first published record of *L. grylio* in the diet of *A. piscivorus.*

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***AGKISTRODON PISCIVORUS CONANTI* (Florida Cottonmouth). DIET and PHENOTYPE.** *Agkistrodon piscivorus conanti* is a semi-aquatic pit viper native to the southeastern United States (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Books, Washington, D.C. 668 pp.). On 25 June 2013, a nuisance female amelanistic *A. p. conanti* (total length = 58.5 cm; 250 g) was removed from a residential property in Flagler Co., Palm Coast, Florida, USA by staff from the Central Florida Zoo, Seminole Co., Lake Monroe, Florida, USA. The snake was subsequently transported to the Central Florida Zoo on the day of capture. During physical exam, symmetrical internal lumps could be seen throughout the body (Fig. 1), and a large, unknown item inside the snake could be felt via palpation. Due to health concerns for the *A. p. conanti*, it was ultimately decided that surgery was necessary to remove the object that appeared to be lodged in its stomach.

A *Pantherophis guttatus* (Red Cornsnake; total length = 71 cm; 100 g) was surgically-removed from the stomach of the *A. p. conanti* on 30 June 2013. Despite being ingested, the *P. guttatus* was largely intact following several days after capture and was becoming necrotic. While *A. piscivorus* has been known to feed on several snake species (Gloyd and Conant 1990. Snakes of the *Agkistrodon* Complex. Society for the Study of Amphibians and Reptiles, St. Louis, Missouri. 620 pp.; Ernst and Ernst, *op. cit.*), to our knowledge this is the first recorded account of *P. guttatus* in the diet of the species. The *A. p. conanti* has been added to the reptile collection at the Central Florida Zoo.

FIG. 1. A postprandial amelanistic *Agkistrodon piscivorus conanti*, that had consumed a *Pantherophis guttatus* in Flagler Co., Florida, USA.

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***BOTHROPS ASPER* (Fer-de-lance). DIET.** Members of the genus *Bothrops* are diet generalists (Martins et al. 2002. *In* Schuett et al. [eds.], Biology of the Vipers, pp. 307–328, Eagle Mountain Publishing, Eagle Mountain, Utah). Juvenile *B. asper* eat arthropods, frogs, and lizards while adults also consume birds, rodents, and medium-sized mammals (Savage 2002. The Amphibians and Reptiles of Costa Rica: A Herpetofauna between Two Continents, between Two Seas. Univ. Chicago Press, Illinois. 934 pp.; Sasa et al. 2009. Toxicon 54:904–922). Here we report the first observation of any *Bothrops* consuming a caecilian.

On 15 April 2013, a *Bothrops asper* was observed consuming a *Dermophis parviceps* (Slender Caecilian) on a dirt/mud road bordered by mid-elevation primary forest at Rara Avis Rainforest Reserve bordering Braulio Carillo National Park, Sarapiqui, Costa Rica (10.28201°N, 84.04577°W, datum WGS84; elev. 738 m). At 0725 h MAJ and JRS encountered the *B. asper* (total length = 758 mm) lying across a shallow pool of water in the road. Based on size and lack of a yellow caudal tip the snake could have been a juvenile female or adult male (Savage, *op. cit.*). A nearly immobile caecilian, *D. parviceps,* (SVL = 371 mm) was semi-coiled, also in the shallow pool, 40 cm from the snake. The caecilian's head was first below the surface of the water but rose above the surface during the observation, indicating that this was not a case of scavenging. While no strike by the snake was observed, the caecilian had likely been envenomated. The authors returned to the location at 0830 h. At this point the snake was lying by the side of the pool and the caecilian was coiled in the pool (Fig. 1). The snake removed the caecilian from the water 7 min after the last apparent movement by the caecilian. The caecilian was folded in a U-shape, one-fifth of the way down the body. After 31 min the snake proceeded to consume the caecilian starting at the fold in the body (Fig. 2). The consumption of the caecilian took 21 min. The entire predation event lasted longer than 2.25 h. The presence of the authors and a group of tourists may have increased the duration of the predation event.

FIG. 1. *Bothrops asper* prior to consuming the (presumably) envenomated *Dermophis parviceps.*

FIG. 2. *Bothrops asper* consuming a *Dermophis parviceps* starting at a point one-fifth of the way down the body instead of directly from the head of the caecilian.

This observation is notable for two reasons. First, the novel observation of consumption of a fossorial caecilian by a terrestrial *B. asper.* Second, the snake did not consume the caecilian directly from the head as is often noted when elongate predators eat elongate prey (Jackson et al. 2004. Zoology 107:191–200). It is unclear whether this was a rare event, representing opportunistic predation by *B. asper*, or whether caecilians make up a regular part of their diet.

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***BOTHROPS ASPER* (Terciopelo). DIET.** The genus *Bothrops* is widely distributed in South America and Central America (Campbell and Lamar 2004. The Venomous Reptiles of the Western Hemisphere. Comstock Publ., Ithaca, New York. 870 pp.). The species belonging to this genus are generalists and feed mostly on insects, frogs, lizards, snakes, birds and mammals (Schuett 2002. Biology of the vipers. Eagle Mountain, Utah. 580 pp.). However, references regarding wild prey are scarce.

At 1100 h on 18 June 2013 an adult female *Bothrops asper* (total length = 1780 mm) was found in a patch of tropical evergreen forest in Flavio Alfaro, Ecuador (0.390°S, 79.849°W, datum WGS84; elev. 427 m). The snake had been killed by farmers and was taken to the laboratory where it was dissected. In the stomach we found the whole body of a rat (*Proechimys semispinosus)* in an advanced stage of digestion. This rat was previously cited as prey of *B. asper* in Costa Rica (Sasa et al. 2009. Toxicon 54:904–922). In the intestine we found porcupine quills from *Coendou rothschildi* (Fig. 1) never before reported as prey of *B. asper.* We thank Víctor H. Luja and Rogelio Cedeño for comments on this note.

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PHOTO BY BELÉN BAUS

FIG 1. Dissected *Bothrops asper* with *Proechimys semispinosus* and *Coendou rothschildi* quills found inside.

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***COLUBER* (=*MASTICOPHIS*) *BILINEATUS* (Sonoran Whipsnake). DIET.** The diet of the swift-moving *Coluber bilineatus* has been reported to include birds, small mammals, lizards, snakes, and frogs (Stebbins 2003. A Field Guide to Western Reptiles and Amphibians, 3rd ed. Houghton Mifflin Co., Boston, Massachusetts. 533 pp.) To our knowledge, the only report of a *C. bilineatus* preying upon a frog or any amphibian, is an adult *Lithobates yavapaiensis* consumed by a "large" adult *C. bilineatus* in Buehman Canyon, Pima Co., Arizona (Bezy and Enderson 2003. Son. Herpetol. 16:17). On 18 Sep 2013 at 1608 h, JCR heard a thrashing and a frog squawking in cattails at the edge of a flooded mine adit in Middlemarch Canyon, Dragoon Mountains, Cochise Co., Arizona, USA (31.881429°N 109.953556°W, datum WGS84; elev. 1698 m). An approximately 1.2 m (total length) *C. bilineatus* emerged from the cattails with an adult (~70 mm SVL) *L. chiricahuensis* in its mouth. The snake had grasped the frog by the left hindquarters, but quickly adjusted so the frog's head was in its mouth. JCR approached for better pictures (Fig. 1; UAZ 57569-PSV), and at 1612 h the snake, with the frog still in its mouth, disappeared into grasses at the edge of the pond, or into the water.

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***COLUBER* (= *MASTICOPHIS*) *FLAGELLUM* (Coachwhip). DIET / OPHIOPHAGY.** *Coluber flagellum* is known to take a variety of prey items including snakes (Beaman and Basey 2011. Herpetol. Rev. 42:437). Here we report a snake as a prey item not previously documented for *C. flagellum*.

On 27 April 2012, a *C. flagellum* was encountered ingesting a live *Crotalus ruber* (Red Diamond Rattlesnake; Fig 1) in Sycamore Canyon Wilderness Park, Riverside, Riverside Co., California, USA (33,937083°N, 117.317605°W; datum WGS 84). The *C. ruber* had five rattle segments, including the button, which corresponds to an adult size within the range of 60–80 cm snout-vent length (N = 89; Dugan 2011. Ph.D. Dissertation, Loma Linda University, Loma Linda, California). Digital images were deposited in the herpetological collections of the Natural History Museum of Los Angeles County (LACM PC 1605, 1607)

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FIG. 1. *Coluber bilineatus* with adult *Lithobates chiricahuensis* in its mouth, Cochise Co., Arizona, USA.

FIG. 1. *Coluber flagellum* feeding on *Crotalus ruber*, Riverside Co., California, USA.

***CONTIA TENUIS* (Sharp-tailed Snake). PREDATION.** *Latrodectus mactans* (Black Widow) is known to prey on a variety of organisms, including snakes (Klauber 1940. Trans. San Diego Soc. Nat. Hist. 9:87–162; Jones et al. 2011. Herpetol. Rev. 42:440–441). This is the first arachnid predation documented for *C. tenuis*. On 1 July 2013, at 0645 h, one of us (NGT) observed a snake suspended in the web of a female *L. mactans* beneath a parked vehicle at 4519 Plantation Drive, Fair Oaks, California, USA (34.6480310°N, 121.2995338°W, datum WGS 84; Fig. 1). The spider was positioned to the side of the snake's head, and a pin-sized drop of blood was visible near the snake's mouth. It appeared that the spider was in the process of consuming the snake. Digital images were deposited in the herpetological collections of the Natural History Museum of Los Angeles County (LACM-PC 1668–1672).

FIG. 1. Adult female *Latrodectus mactans* (Black Widow) feeding on *Contia tenuis*, Fair Oaks, California, USA.

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***CROTALUS ANGELENSIS* (Isla Ángel de la Guarda Rattlesnake). DIET and PREDATION.** On 23 June 2012 we found a deceased adult *Crotalus angelensis* (Total length = 770 mm) inside the desiccated corpse of an adult *Lampropeltis getula* (Common Kingsnake; Total length = 1130 mm) on the southwestern coast of Isla Ángel de la Guarda (29.140250°N, 113.297983°W; datum WGS 84) in the Gulf of California, Baja California, Mexico (Fig. 1). It appeared that the kingsnake had died while consuming the rattlesnake because 260 mm of the posterior was emerging from the kingsnake's mouth, but the timing and cause of death

FIG 1. Deceased and dessicated *Lampropeltis getula* that died while consuming an adult *Crotalus angelensis;* note mass of feathers inside the *Crotalus angelensis*.

are unknown. A mass of black feathers from an unidentified bird was embedded in the stomach of the rattlesnake, the first known record of this species consuming a bird. Little is known regarding the predators and prey of *C. angelensis*, although *Sauromalus hispidus* (Spiny Chuckwalla) has been recorded as a diet item (Grismer 2002. Amphibians and Reptiles of Baja California, Including its Pacific Islands and the Islands in the Sea of Cortés. Univ. California Press, Berkeley. 339 pp.), and insular populations of the closely related Speckled Rattlesnake (*C. mitchellii*) are known to prey upon *Uta stansburiana* (Side-blotched Lizard) and *S. hispidus* (Meik et al. 2012 Herpetol. Rev. 43:556–560). *Lampropeltis getula* is known to prey upon rattlesnakes elsewhere in its range, although its diet has not been studied on Isla Ángel de la Guarda. Geo-referenced photographs are vouchered at the San Diego Natural History Museum, San Diego, CA (SDSNH_HerpPC_05225–05232).

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***CROTALUS ATROX* (Western Diamond-backed Rattlesnake). RAIN HARVESTING BEHAVIOR.** To date, few episodes of the rattlesnake *Crotalus atrox* obtaining water from rain, sleet, and snow in arid habitats have been reported (Repp and Schuett 2009. Southwest. Nat. 53:108–114). However, those episodes have been observed only in late winter; that is, during the inactive season, and only from individuals inhabiting the Sonoran Desert. Herein, we report the first observation of a *C. atrox* harvesting rainwater during the active season (summer) in the northern Chihuahuan Desert.

On 28 August 2010, at 1640 h on a cloudy and breezy afternoon, an adult male *C. atrox* (SVL = 1000 mm; tail length = 80

FIG. 1. Adult male *Crotalus atrox* harvesting rainwater from a pool formed between its coils in late August at Indio Mountains Research Station, Hudspeth Co., Texas.

mm; 689.9 g) fitted with a Holohil Ltd. SB-2 transmitter was radiotracked at Indio Mountains Research Station (IMRS), Hudspeth Co., Texas, USA (30.769358°N, 105.009242°W, datum WGS 84; 1240 m elev.), as part of an ongoing study. Initially the rattlesnake was observed resting in a tightly coiled position at the base of a grass (*Aristida purpurea*) of an alluvial slope (10°). A few minutes later; as a brief rain was taking place in the area, we returned to examine if the snake's behavior was affected by the rain. To our surprise, we found the rattlesnake located in the same location but with its body in a loose coil position with its last two coils flattened dorso-ventrally and tightly in contact with each other (Fig. 1). As rain progressed, a water pool was formed between the latter coils and consequently with the head facing down the rattlesnake proceeded to drink rainwater for ca. 20 min. The latter behavior was clearly detected by the slight rhythmic movements of its jaw musculature. After the sporadic rain episode was over, the rattlesnake continued harvesting the remaining rainwater from its body and then went back to the same resting position until dusk. Rain harvesting during the active season has been observed in *C. molossus* at IMRS (Mata-Silva et al. 2012. Herpetol. Rev. 43:145-146).

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***DROMICODRYAS BERNIERI* (Bernier's Striped Snake). DIET.** Most Malagasy snake species appear to feed primarily on frogs and lizards (Mercurio et al. 2006. Salamandra 42:181-183). *Dromicodryas bernieri* was thought to be strictly saurophagous (Cadle 2003. *In* Goodman and Benstead [eds.], Natural History of Madagascar, pp. 997–1004. Univ. Chicago Press, Chicago; Gehring 2006. Zeitschrift des Kölner Zoo - Heft 49:127–141) but was recently found to feed on amphibians as well (Gandola et al. 2013. Herpetol. Rev. 44:689-690). Here, predation on *Chalarodon madagascariens* by *D. bernieri* is described.

In the late afternoon on 16 December 2007, a *D. bernieri* was observed foraging in heavily degraded spiny forest in Ifaty, Madagascar (23.070806°S, 43.364108°E, datum: WGS84). The specimen was chasing an adult male *Chalarodon madagascariensis*, moving rapidly with its anterior body raised above the ground. Due to the observer, the snake ceased the hunt and fled. On 18 December 2007 at 0910 h, a second *D. bernieri* was found

FIG. 1. *Dromicodryas bernieri* feeding on a *Chalarodon madagascariensis* in Ifaty, Madagascar.

constricting and swallowing a *C. madagascariensis* (Fig. 1). While constricting, the snake did not keep its prey in its mouth and raised its head upwards to observe the surroundings. Constriction continued for approximately 5 min after which the prey was swallowed, head first, in approximately 10 min.

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***ECHIS COLORATUS* (Palestine Saw-scaled Viper). REPRODUCTION.** *Echis coloratus* is known to occur in Egypt east of the Nile, Israel south to western and southern Arabian Peninsula where it frequents rocky ground (Phelps 2010. Old World Vipers A Natural History of the Azemiopinae and Viperinae. Edition Chimaira, Frankfurt am Main. 558 pp.). Up to 10 eggs are laid in August (Bar and Haimovitch 2011. A Field Guide to Reptiles and Amphibians of Israel. Pazbar LTD 1989, Herzilya Israel. 245 pp.); eggs are laid about 75 days after copulation (Phelps *op. cit.*). The purpose of this note is to present data on the monthly events in the testicular cycle and the minimum size for maturity of males.

A sample of ten *E. coloratus* males consisting of eight adults (mean SVL = 545.5 mm ± 67.9 SD, range = 465–663 mm) and two subadults (mean SVL = 447 mm ± 15.6 SD, range = 436–458 mm) collected 1957 to 2012 and deposited in the Natural History Collections of Tel Aviv University (TAUM), Tel Aviv, Israel was examined. Specimens examined by region were: A'rava Valley (TAUM 6112, 6113, 9016), Central Negev (TAUM 2821, 15901), Dead Sea Area (TAUM 4522, 5188, 14116, 16186), Shomeron (TAUM 16488). The left testis was removed, embedded in paraffin and cut into sections of 5 µm. Histology slides were stained with Harris' hematoxylin followed by eosin counterstain and were deposited in TAUM.

Three stages were observed in the monthly testicular cycle (Table 1), 1) regression, the germinal epithelium in the seminiferous tubules is reduced to a few layers, consisting of spermtogonia and sertoli cells; 2) recrudescence, there is a proliferation of germ cells for the approaching period of sperm formation. Primary spermatocytes predominate; 3) spermiogenesis, the lumina of the seminiferous tubules are lined by sperm or clusters of metamorphosing spermatids. The period of sperm production in spring (Table 1) fits within the ca. 75 days needed for

TABLE 1. Monthly stages in the testicular cycle of eight adult males of *Echis coloratus* from Israel.

Month	N	Regression	Recrudescence	Spermiogenesis
March	1	0	1	0
April	1	0	0	1
May	2	0	0	2
June	3	0	0	3
October	1	1	0	0

egg development (Phelps, *op. cit.*). The smallest mature male (spermiogenesis) measured 465 mm SVL (TAUM 6112) and was collected in June. Two other subadult males from June: 1) (TAUM 4552) SVL = 458 mm exhibited recrudescence and 2) (TAUM 6113) SVL = 436 mm exhibited regression.

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***GERARDA PREVOSTIANA* (Gerard's Watersnake). REPRODUCTION.** Although *Gerarda prevostiana* is a fairly common species in coastal mangrove forests and adjacent mudflat habitats from western India to the Philippines (Murphy 2007. Homalopsid Snakes: Evolution in the Mud. Krieger Publ. Co., Malabar, Florida. 260 pp.) and Borneo (Das et al. 2013. Asian Herpetol. Rec. 4:76–78), little has been documented concerning reproduction.

FIG. 1. Adult female *Gerarda prevostiana* with clutch of five juveniles.

TABLE 1. Measurements of adult and five neonate *Gerarda prevostiana*, post-partum.

Animal ID	Mass (g)	SVL (mm)	Tail length (mm)
Adult female	29.52	399	58
Neonate1	2.70	145	25
Neonate2	2.93	158	25
Neonate3	2.69	155	24
Neonate4	2.35	148	26
Neonate5	2.71	145	28
Neonate average (SD)	2.68 (0.21)	150 (6)	26 (2)

On 16 November 2013 at approximately 2130 h, we collected a gravid female *G. prevostiana* at Pasir Ris Park, Singapore (01.378598°N 103.950738°E; datum: WGS 84). On 26 November 2013, the female gave birth to five offspring (Fig. 1; Table 1). The combined post-partum neonate mass was 13.38 g, which is 45.3% of the mass of the mother post-partum or 31.2% of the combined mass of adult and offspring. To our knowledge, this is the first description of relative clutch mass and intra-clutch variation in *G. prevostiana*. This work was conducted under NUS Institutional Animal Care and Use Committee (B01/11(A1)13) and National Parks Board of Singapore (NPRP10-095-2a) permission.

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***LAMPROPELTIS GETULA* (Common Kingsnake). DIET.** *Lampropeltis getula* has long been known to prey on turtle eggs and "so addicted are they to this egg diet, that the natives consider that is a common happening to find snakes awaiting the egg deposition" (Wright and Bishop 1915. Proc. Acad. Nat. Sci. Phila. 67:107–192). Other reports of turtle egg-eating behavior by *L. getula* include a variety of turtle genera in the families Chelydridae, Kinosternidae, and Emydidae (Ernst and Ernst 2003. Snakes of the Unites States and Canada. Smithsonian Press, Washington, D.C. 668 pp.). *Terrapene carolina* have been mentioned as a possible species whose eggs are eaten, but no direct observation appears to have been recorded. Knight and Loraine (1986. Brimleyana 12:1–4) reported finding a female *L. getula* less than 1 m away from a nesting *T. carolina* with its head elevated from the ground and directed toward the nesting female turtle. It was probable, given the circumstances that this snake was intending to ingest eggs from this nest. Reported here is the first direct observation of *L. getula* preying on a *T. carolina* nest.

On 5 July 2012 at 1800 h I observed a female *T. carolina* nesting on my front lawn near Asheboro, in Randolph Co., North Carolina, USA. This turtle dug a shallow nest, deposited 3–4 eggs, covered the nest, and left the nesting site approximately 2 h later. On 9 July 2012, at 1058 h I observed a *L. getula* pushing its

FIG. 1. *Lampropeltis getula* digging into *Terrapene carolina* nest.

FIG. 2. *Lampropeltis getula* drinking contents of *Terrapene carolina* egg.

snout into the ground directly in the center of the nest (Fig. 1). The snake pushed dirt sideways toward the margins of the nesting hole for approximately 20 min in a similar digging method as reported by others (Posey 1973. Bull. Maryland Herpetol. Soc. 9:105; Brauman and Fiorillo 1995. Herpetol. Rev. 26:101–102). The snake then opened the top egg with its rostrum or teeth making several slits in the long axis of the egg shell, drank the contents of the egg (Fig. 2), and ingested the nearly empty egg shell whole. As best I could tell, the remaining two to three eggs were eaten whole and undamaged. Once the snake removed its head from the nest hole, it responded to my presence by orienting its head in my direction and flicking its tongue rapidly and then slowly crawled away from the nest. This entire predation event lasted from 1058 h to 1246 h.

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***LEPTOPHIS AHAETULLA* (Green Snake). DIET.** *Leptophis ahaetulla* is a medium-sized arboreal or semi-arboreal species that feeds primarily on hylid frogs and small lizards (Albuquerque et al. 2007. J. Nat. Hist. 41:1237–1243), and is widely distributed from southern Mexico to northern Uruguai (Oliver 1948. Bull. Am. Mus. Nat. Hist. 92: 157–280). On 11 June 2013, at 0930 h, on the Aiuaba Ecological Station (ESEC Aiuaba; 14.5911°S, 39.0655°W, datum WGS84; elev. ca. 466 m), state of Ceará, Brazil, an adult female *L. ahaetulla* (SVL = 890 mm) was observed perched on branches of a tree ca. 1.8 m from the ground, preying on an adult *Corythomantis greeningi* (SVL = 68.11 mm; 18 g). When first sighted, the snake was swallowing the head of the frog. The remaining ingestion process took 10 min (Fig. 1A), after which the snake was captured. The *L. ahaetulla* and the *C. greeningi* were deposited in the Coleção Herpetológica da Universidade Regional do Cariri (URCA-H 5539 and 5550, respectively; Fig. 1B). To the best of our knowledge, there are no records of predation of *C. greeningi* by *L. ahaetulla*.

Anurans and lizards consumed by *L. ahaetulla* are nocturnal and probably are captured by day when inactive (Martins and Oliveira 1999. Herpetol. Nat. Hist. 6:78–150; Albuquerque et al. 2005. Herpetol. Rev. 36:324–325; Solé et al. 2010. Salamandra 46:101–103). *Corythomantis greeningi* is distributed mainly in Caatinga biome and presents morphological features, such as a dermis that is co-ossified with the underlying cranial bones to

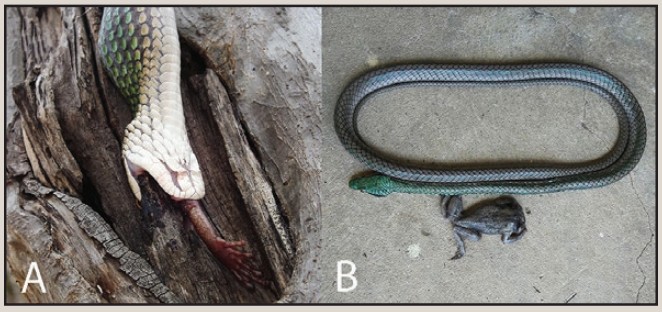

PHOTO BY HERIVELTO F. DE OLIVEIRA

FIG.1. Predation on *Corythomantis greeningi* by *Leptophis ahaetulla*.

form a unified structure (Trueb 1970. Univ. Kansas Publ. Mus. Nat. Hist. 18:547–716), and phragmotic behavior, that play important roles in defense (Jared et al. 2005. J. Zool. Lond. 265:1–8).

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***LEPTOPHIS DIPLOTROPIS* (Pacific Coast Parrot Snake). DIET.** *Leptophis diplotropis* is endemic to Mexico and has been designated as a threatened species (SEMARNAT 2010. Norma Oficial Mexicana NOM-059-SEMARNAT-ECOL-2010. Protección

FIG 1. *Leptophis diplotropis* feeding on *Smilisca baudinii* at Universidad del Mar campus Puerto Escondido, San Pedro Mixtepec, Oaxaca, México.

ambiental-especies nativas de México de flora y fauna silvestre, Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio-lista de especies en riesgo. Diario Oficial de la Federación 6 de marzo: pp. 1–78). This species ranges from Sonora along the pacific cost to the Isthmus of Tehuantepec in Oaxaca and into several central states, including Hidalgo, Morelos and Puebla (Berriozabal-Islas et al. 2012. Check List 8:1370–1372). It is arboreal and feeds primarily on frogs, lizards, snakes, and bird eggs (Canseco-Márquez and Gutiérrez-Mayén 2010. Anfibios y Reptiles de Valle de Tehuacán-Cuicatlán. México. BUAP & CONABIO. 302 pp.; Dixon and Lemos-Espinal 2010. Anfibios y Reptiles del Estado de Querétaro, México. Texas A&M University, UNAM, CONABIO. México. 428 pp.).

At 1550 h on 24 October 2013, on site of Universidad del Mar campus Puerto Escondido, San Pedro Mixtepec, Oaxaca, México (15.88942°N, 97.075757°W, datum WGS84; elev. 75 m) we observed a *L. diplotropis* attack and consume a *Smilisca baudinii* (Mexican Treefrog; Fig. 1) over 11 min. This is the first report of *S. baudinii* as a part of the diet of *L. diplotropis*.

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***MICRELAPS MUELLERI* (Erdviper). REPRODUCTION.** *M. muelleri* is known from the Northern Negev of Israel, northward and also occurs in Syria, Jordan and Lebanon; it is a mildly venomous rear-fanged snake (Bar and Haimovitch 2011. A Field Guide to Reptiles and Amphibians of Israel. Pazbar LTD 1989, Herzliya, Israel. 245 pp.). There is a report that it is viviparous (Arbel [ed.] 1984. Reptiles and Amphibians, Vol. 5. Plants and Animals of the Land of Israel. An Illustrated Encyclopedia. Ministry of Defence and Publishing House for the Protection of Nature, Tel-Aviv, Israel. 248 pp.). The purpose of this note is to report a litter size of two for *M. muelleri*.

One *M. muelleri* female (SVL = 398 mm) deposited in the Tel Aviv University Museum (TAUM) as TAUM 1895, collected June 1955 in the Yizreel Valley Region (35.24166°N, 32.59638°E, datum WGS 84) was examined.

A ventral incision was made in the posterior third of the body. Two oviductal eggs were present, one in each oviduct. The eggs measured 20 × 4 mm and 24 × 4 mm, respectively. The eggs were not dissected, but externally there was no evidence of embryonic development. The ovaries were in quiescent condition (no yolk deposition). This is, to our knowledge, the first published record of a litter size of two for *M. muelleri*.

We thank Shai Meiri (TAUM) for permission to examine *M. muelleri*, Ezra Maza for facilitating the loan and the National Collections of Natural History at Tel Aviv University for providing *M. muelleri* for our examination.

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***OXYBELIS FULGIDUS* (Green Vine Snake). DIET.** *Oxybelis fulgidus* belongs to the group of Ophisoglyph Colubrids, with a neotropical distribution from México through América Central to Bolívia (Cisneros-Heredia and Touzet 2007. Herpetozoa 19:188-189). This species has generally been described as an opportunistic sit and wait predator, however they may also actively forage, feeding principally on lizards and birds, however small mammals are also consumed (Scartozzoni et al. 2009. S. Am. J. Herpetol. 4:81-89; Fraga et al. 2012. Herpetol. Rev. 43:495-496). This note contributes three new species to the list of food items in the diet of *O. fulgidus*, two birds and one lizard.

An *O. fulgidus* was observed predating a *Turdus leucomelas* (Pale-breasted Thrush) on 22 December 2008, an *Iguana iguana* (Green Iguana) on 02 January 2009, and a *Pitangus sulphuratus* (Great Kiskadee) on 24 December 2011 (Fig. 1); the first and third observations were in Parque Residencial Aquariquara I, Manaus, Amazonas, Brazil (3.084111°S, 59.961777°W; datum WGS84) and the second observation was in Praia da Lua, Manaus, Amazonas, Brazil (3.032555°S, 60.134111°W; datum WGS84). The only snake collected was from the third event, now INPA-H-32303 in

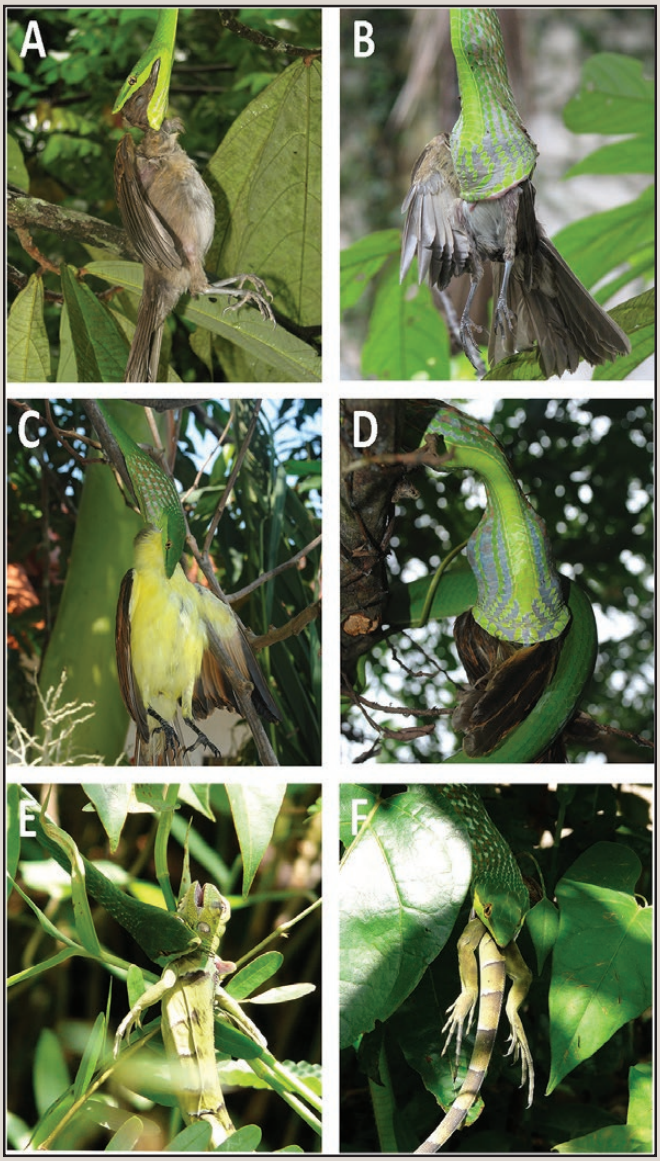

FIG. 1. *Oxybelis fulgidus* consuming their prey, *Turdus leucomelas* (A, B; Pale-breasted Thrush), *Pitangus sulphuratus* (C, D; Great Kiskadee), and *Iguana iguana* (E, F; Green Iguana).

the collection of Reptiles and Amphibians of Instituto Nacional de Pesquisas da Amazônia. The snake began to ingest the prey headfirst with *T. leucomelas* (Fig. 1A, B) and *P. sulphuratus* (Fig. 1C, D) the ingestion time for the latter took 2 h and 20 min while the iguana was swallowed in only 9 min (Fig. 1E, F). The great difference in ingestion time could be due to the difficulty for an ophisotglyph snake to envenomate the bird through the plumage, resulting in a longer processing time (Kardong 1982. Mem. Inst. Butantan 46:105–118).

We are grateful to Gersonval Leandro da Silva Monte who took the photo of the Green Iguana and "Rato" Rafael de Fraga, mentor in herpetology.

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***PITUOPHIS RUTHVENI* (Louisiana Pinesnake). GROWTH RATES.** *Pituophis ruthveni* is a large-bodied constrictor endemic to western Louisiana and eastern Texas, USA, and is currently listed as a candidate species under the U.S. Endangered Species Act. Surveys suggest that the species has declined precipitously in recent decades and is now restricted to seven (several possibly recently extirpated) isolated populations (Rudolph et al. 2006. Southeast. Nat. 5:463–472). Although growth rates have been reported for radio-tracked *P. ruthveni* (Himes et al. 2002. J. Herpetol. 36:683–687), no information has been published regarding the growth rates of individuals without implanted transmitters. Here we report data on growth rates of *P. ruthveni* without radio transmitters and briefly compare them to individuals with transmitters.

Pituophis ruthveni were collected via a trapping effort conducted to monitor the species' populations. Data reported here were collected from 2007 to 2013 at multiple sites (Angelina National Forest, Angelina and Jasper counties, Texas; private property in Bienville Parish, Louisiana; and Ft. Polk, Vernon Parish, Louisiana). Snakes were implanted with PIT (Passive Integrated Transponder) tags and measured (SVL and total length to the nearest cm). All snakes were considered adults based on length. We included all recaptures that occurred at least 8 mo after initial capture (N = 8). Average monthly increases in SVL were highly variable ranging from 0 (for an individual monitored for only 8 months) to 0.49 cm/mo (Table 1). We observed a tendency for smaller animals to have higher growth rates than larger animals, a pattern noted by Himes et al. (*op. cit.*).

The growth rates reported in Table 1 are generally similar to those reported in Himes et al. (*op. cit.*). Mean growth rates (total length) of the adult animals in the Himes study were 0.26 cm/mo for males and 0.30 cm/mo for females. In this study mean growth rates (total length) were 0.28 cm/mo for males and 0.12 cm/mo for females. Females in this study were substantially larger than in Himes et al. (*op. cit.*), possibly explaining the lower growth rates. Growth rates of adult *P. ruthveni* without implanted transmitters in our study were generally similar to those of adult individuals with implanted transmitters (Himes et al., *op. cit.*), indicating transmitters may not be a major detriment to growth of *P. ruthveni*. However, other studies have shown negative effects of transmitters on mass gain in *Pantherophis obsoletus* (Weatherhead and Blouin Demers 2004. Wildl. Soc. Bull. 32:900–906) and survival in *P. ruthveni* (Rudolph et al. 1998. Herpetol. Rev. 29:155–156). Despite the lack of an obvious impact of transmitters on growth of *P. ruthveni*, researchers should remain cognizant of the potential for alteration of growth and behavior in snakes implanted with radiotransmitters.

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***SISTRURUS MILIARIUS* (Pygmy Rattlesnake). DIET.** *Sistrurus miliarius* is known to take a variety of endothermic and ectothermic prey items including small rodents (*Microtus pinetorum*, *Oryzomys palustris*, *Peromyscus maniculatus*, *Reithrodontomys humulis*) and snakes (*Carphophis amoenus*, *Coluber constrictor*, *Diadophis punctatus*, *Nerodia* sp., *S. miliarius*, *Storeria dekayi*, *Thamnophis sauritus*, *T. sirtalis*, *Virginia valeriae*; Ernst and Ernst 2011. Venomous Reptiles of the United States, Canada, and Northern Mexico, Volume 1. Johns Hopkins Univ. Press, Baltimore, Maryland. 352 pp.). On 5 September 2013 at 0910 h, JRL and DJN captured an adult male *S. miliarius* (SVL = 39.2 cm; total length = 44.5 cm; 46 g) in a trap array located on

TABLE 1. Measurements and growth rates of *Pituophis ruthveni* from Texas and Louisiana, USA. (*) denotes an estimated SVL based on a regression model of unpublished *P. ruthveni* total lengths (TL) and snout–vent lengths (SVL) (N = 56).

Sex	Date Cap. 1	Date Cap. 2	Interval (mo.)	TL (cm)		SVL (cm)		Change (cm)		Mean growth (cm/mo)	
				Cap. 1	Cap. 2	Cap. 1	Cap. 2	SVL	TL	SVL	TL
M	Apr. 2007	May 2012	61	130	148	114*	130*	18	16	0.30	0.26
M	Jun. 2008	May 2012	47	154	157	136*	139	3	3	0.06	0.06
F	Jun. 2008	Jun. 2013	60	151	152	132*	134	1	2	0.02	0.03
F	Sept. 2008	Jun. 2013	57	130	143	114	126	13	12	0.23	0.21
F	Oct. 2008	Jun. 2009	8	141	142	126	126	1	0	0.13	0.00
M	Jun. 2009	May 2012	35	144	162	123	140	18	17	0.51	0.49
M	Apr. 2009	Apr. 2012	36	135	138	116	119	3	3	0.08	0.08
M	Jun. 2009	May 2011	23	139	149	121	130	10	9	0.43	0.39

the Camp Shelby Joint Forces Training Center, De Soto National Forest, Perry County, Mississippi, USA. The snake had recently fed as indicated by a large bolus in its stomach, and upon palpating, the snake regurgitated a male *Reithrodontomys fulvescens* (Fulvous Harvest Mouse). It is possible that the *R. fulvescens* was consumed in the trap, and therefore it is unknown how frequently *S. miliarius* will take this species as prey under natural circumstances. However, *R. fulvescens* is the second most abundant small mammal captured at this pitcher plant (*Sarracenia* sp.) wetland trap site (JRL, unpubl. data). On 2 December 2013 at 1130 h, JRL and ALS captured a juvenile male *S. miliarius* (SVL = 32.5 cm; total length = 37.1 cm; 27.9 g) basking in close proximity to this same trap array, and upon palpating, the snake regurgitated a female *Virginia striatula* (Rough Earthsnake). To the best of our knowledge these are the first documented occurrences of *R. fulvescens* and *V. striatula* in the diet of *S. miliarius*, and both represent novel food items for the genus *Sistrurus* (Ernst and Ernst, *op. cit.*).

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***THAMNOPHIS COUCHII* (Sierra Gartersnake). PREDATION.** *Thamnophis couchii* is a highly aquatic species that inhabits streams, rivers, meadow ponds, and reservoirs of the Sierra Nevada of California from the Pit River drainage south to the western edge of the Tehachapi Mountains, with several populations east of the Sierran crest at Owens Valley, and along the Walker, Truckee, and Carson rivers in Nevada (Stebbins 2003. A Field Guide to Western Reptiles and Amphibians, 3rd ed. Houghton Mifflin Co., New York. 533 pp.; Rossman et al. 1996. The Garter Snakes: Evolution and Ecology. Univ. Oklahoma Press, Norman, 332 pp.). Although *T. couchii* is frequently encountered within its range, its only documented predators are *Buteo jamaicensis* (Red-tailed Hawk; Fitch 1949. Am. Midl. Nat. 41:513–579), *Coluber constrictor* (Yellow-bellied Racer) and *Diadophis punctatus* (Ring-necked Snake; Wiseman et al. 2007. Herpetol. Rev. 38:344–345). Herein, I report a previously undocumented predator of *T. couchii*.

On 10 September 2012 at 1030 h the posterior portion (ca. 7 cm) of a juvenile *T. couchii* was observed within the scat of a *Lontra canadensis* (River Otter) on the top of a boulder located ca. 3 m from the bank of the North Fork Feather River (Butte Co., CA.; 39.762892°N, 121.459782°W, datum WGS84; elev. 314 m), 0.8 km downstream of Bardee's Bar. The scat also contained the remains of introduced Signal Crayfish (*Pacifasticus leniusculus*). River Otters prey predominately on fish, crayfish, and other invertebrates but will also take amphibians and reptiles (Melquist et al. 2003. *In* Feldhamer et al. [eds], Wild Mammals of North America: Biology, Management, and Conservation, pp. 708–734. Johns Hopkins Univ. Press, Baltimore, Maryland). I thank Justin Garwood for his input and help tracking down literature sources.

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***THAMNOPHIS SIRTALIS DORSALIS* (New Mexico Gartersnake). DIET.** Although avian nest predation by snakes has been infrequently reported, snakes may be predominant nest predators (Stake et al. 2005. J. Herpetol 39:215–222; Thompson III and Burhans 2003. J. Wildl. Manage. 67:408–416). On 10 July 2013 at ca. 1100 h we observed a *Thamnophis sirtalis dorsalis* predating an *Empidonax traillii extimus* (Southwestern Willow Flycatcher) nest with two nestlings near San Marcial, Socorro Co., New Mexico, USA. The *T. s. dorsalis* was anchored posteriorly ca. 7.6 cm below the nest, with the anterior third of its body hanging vertically in the process of ingesting a 13-day-old nestling head first. Given the placement of its body, it is likely the *T. s. dorsalis* predated the nest from below, possibly the best way to approach the nest given typical nestling behavior (positioned in or on the edge of the nest to detect potential predators) of *E. t. extimus* nestlings at this stage of their development (Paxton and Owen 2002. An Aging Guide for Willow Flycatcher Nestlings. U.S. Geological Survey. 18 pp.). Upon approach the snake released the nestling, which was ingested to the cloaca, and retreated into the Rio Grande. The nest was located 3 m above the ground in a 5-m-tall, live *Tamarix* sp. (saltcedar). *Thamnophis sirtalis* is known to predate passerine nests (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Books, Washington D.C. 668 pp). To our knowledge, this is the first report of Southwestern Willow Flycatcher nest predation by *T. s. dorsalis*. Research was conducted under United States Fish and Wildlife Service Permit TE819475-3.

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***THAMNOPHIS SIRTALIS PARIETALIS* (Red-sided Gartersnake). DIET AND ACCIDENTAL MORTALITY.** Snakes occasionally die while attempting to consume prey. For example, an *Agkistrodon contortrix* (Copperhead) apparently died after ingesting the head of a *Corvus ossifragus* (Fish Crow); the bird's beak penetrated through the skin of the snake (Beane et al. 2013. Herpetol. Rev. 44:150–151). Likely the death of a *Pituophis catenifer* (Gophersnake) in New Mexico occurred following consumption of an *Athene cunicularia* (Burrowing Owl; Painter et al. 2012. Herpetol. Rev. 43:152). Moreover, semi-aquatic snakes, such as *Agkistrodon piscivorus* (Cottonmouth) and *Nerodia sipedon* (Northern Watersnake), have died from complications related to the spines and fins of ingested fish (Allen and Swindell 1948. Cottonmouth Moccasin of Florida. Herpetologica 4:1st suppl.; Stafford 1952. Copeia 1952:193).

FIG. 1. A *Thamnophis sirtalis parietalis* that died after consuming a *Sternella neglecta* (Western Meadowlark) in central Nebraska. The single puncture hole is visible and located in the swollen area adjacent to the meadowlark skull.

On 23 June 2012, we discovered a gravid female *T. s. parietalis* (SVL = 590 mm) dead along the edge of a small pond in the flood plain of the Platte River in Hall County, Nebraska (40.7873°N, 98.465°W; datum WGS84). We observed the lower mandible of a *Sternella neglecta* (Western Meadowlark) protruding from one exit hole in the snake. We determined death was caused by the beak puncturing through both the digestive system and skin about 200 mm from the tip of the snake's head (Fig. 1). The meadowlark was consumed head first based on the direction of the beak, and we suspect the lower mandible eventually separated from the cranium causing the fatal puncture. The snake and skull of the meadowlark are deposited in the natural history collections at the Sternberg Museum of Natural History, Fort Hays State University, Hays, Kansas (FHSM 16537). *Thamnophis sirtalis* is known to eat a number of bird species but *S. neglecta* has not previously been documented as a prey item (Ernst and Ernst 2004. Snakes of the United States and Canada. Smithsonian Institution Press, Washington D.C. 680 pp.).

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***THAMNOPHIS SIRTALIS SIRTALIS* (Eastern Gartersnake). DIET.** *Thamnophis s. sirtalis* is a generalist feeder and has been known to consume salamanders of the genus *Plethodon* including *P. albagula*, *P. cinereus*, *P. cylindraceus*, *P. dunni*, *P. glutinosus*, and *P. idahoensis* (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Institution Press, Washington, DC. 668 pp.; Konbalinka and Trauth 2003. Herpetol. Rev. 34:378). On 19 November 2013, an adult female *T. s. sirtalis* (SVL = 35 cm; total length = 46 cm; 17.35 g) was captured in a trap array located on the Camp Shelby Joint Forces Training Center, Forrest Co., Mississippi, USA. As the snake was being handled to morphometric data, it regurgitated a *P. mississippi*. The entire range of *P. mississippi* is within the range of *T. sirtalis* (Conant and Collins 1998. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed., expanded. Houghton Mifflin Co., Boston, Massachusetts. 616 pp.). It is possible that the *P. mississippi* was consumed in the trap, and therefore it is unknown how frequently *T. sirtalis* will take this species as prey under natural circumstances. To the best of our knowledge this is the first documented occurrence of *P. mississippi* in the diet of *T. s. sirtalis*.

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***TRIMORPHODON PAUCIMACULATUS* (Sinaloan Lyresnake). DIET.** Little is known about the natural history of *Trimorphodon paucimaculatus*, but it is thought to consume lizards, rodents, birds, and bats from rocky crevices and tree hollows like other lyresnakes (Scott and McDiarmid 1984. Cat. Amer. Amphib. Rept. 352:1–2; García and Ceballos 1994. Field Guide to the Reptiles and Amphibians of the Jalisco Coast, Mexico. Fundación Ecológica de Cuixmala, A.C. UNAM, D.F. 184 pp.). Here we document a new avian species in the diet of *T. paucimaculatus*.

On 15 July 2013, at 0100 h, a female *T. paucimaculatus* (SVL = 905 mm; tail length = 145 mm) was found dead on road at Las Varas–Chacala road, Municipality of Compostela, Nayarit, México (21.163935°N, 105.211336°W, datum WGS84; elev. 39 m). The habitat was tropical deciduous forest. We dissected the snake and found a partially digested *Icterus wagleri* (Black-vented Oriole) ingested head first (Howell and Webb 1995. Guide to the Birds of Mexico and Northern Central America. Oxford Univ. Press, New York. 851 pp.). Additionally, an unidentified nematode parasite was found in the snake's stomach. The snake and stomach contents were deposited in the vertebrate collection at Universidad Autónoma de Aguascalientes (UAA-CV-R265).

FIG. 1. *Trimorphodon paucimaculatus* that had consumed an *Icterus wagleri* (Black-vented Oriole) in Nayarit, México.

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***UROTHECA GUENTHERI* (Striped Glasstail). ANTIPREDATOR DEFENSE.** *Urotheca* is a genus of poorly known terrestrial snakes that can be found in wet and rain forests of Central and South America (Savage 2002. The Amphibians and Reptiles of Costa Rica: A Herpetofauna between Two Continents, between Two Seas. Univ. Chicago Press, Illinois. 934 pp.). Most species in this genus are drab-colored shades of brown, likely providing crypsis among forest floor leaf litter. However, a few species are banded, presumably mimicking sympatric coral snake species (Savage and Crother 1989. Zool. J. Linn. Soc. 95:335–362). Although dorsally drab, *U. guentheri* is brightly colored orange to red ventrally. These high contrast colors may serve as anti-predator "flash" colors. Snakes in this genus have long tails (> 33% total length), that are very fragile (Solórzano 2004. Snakes of Costa Rica. INBio, Costa Rica. 792 pp.). Tails do not regenerate, but may fracture successively closer to the cloaca providing multiple escape opportunities over time (Savage, *op. cit.*). Tail waving may be a mechanism for anti-predator defense (Greene 1987. Snakes: The Evolution of Mystery in Nature. Univ. of California Press, Berkeley, California. 365 pp.), and Savage (*op. cit.*) suggests that tail cleavage is common in this genus, with frequencies above 50% of sampled populations. Herein I report behaviors that may further enhance the effectiveness of this anti-predator strategy.

FIG. 1. Reflexively coiled tail fragment of *Urotheca guentheri* pressing a sharp vertebral element into the skin of the author's left thumb.

On 21 June 2012 at 1320 h we observed an adult male *U. guentheri* on a trail in primary forest within the Monteverde Cloud Forest Preserve, Costa Rica (approx. 10.3001°N, 84.7474°E, datum WGS84; elev. ~1000 m). While handling the snake with minimal force, the tail broke ~3 cm posterior to the cloaca. Upon breakage, the snake began to roll its body in an apparent attempt to escape my grasp. Simultaneously, the detached tail began to writhe, and the bright ventral color was a potent visual stimulus. When I released the snake it ceased rolling and began pressing its head low and attempting to burrow under leaf litter. This behavior reduced the visual stimulus provided by the snake's venter, while the tail continued to flash bright orange as it thrashed in the leaf litter.

In addition to the effect of coloration, the separated tail fragment was able to coil around my finger when I picked it up from the leaf litter (Fig. 1). This behavior did not seem indicative of simple bilateral flexion. Either there was a bias so that the fragment flexed more forcibly to one side, or possibly a reflex action integrated in the remnant spinal cord was able to respond to a grasping stimulus and flex towards the side of tactile stimulus. Furthermore, after coiling around my finger, the proximal end of the tail fragment pressed forcibly against my hand. The protruding vertebral element was sharp and had a startling effect. While the snake was in my grasp, the exposed vertebral column of the remaining tail was also pressed into my skin in a comparable fashion. Similar tail-pressing behaviors have been noted in *Contia tenuis* (Sharp-tailed Snake), *Farancia* spp. (mud and rainbow snakes), and *Carphophis* spp. (wormsnakes). However, in these species it is the hardened tip of an intact tail that is used as a lancet as opposed to a vertebral element. The tail musculature surrounding the cleavage zone of the snake's remaining tail contracted, presumably to staunch bleeding. But, an additional consequence was the exaggerated exposure of the vertebral element.

Savage and Crother (1989) suggest that the tails of *Urotheca* species separate between vertebral centra. However, a fracture plane within, rather than between vertebrae has also been proposed (Wilson 1968. J. Herpetol. 1:93–94). Although I did not examine the tail fragment anatomically, the sharpness of the vertebral element may suggest a pointed or diagonal fracture plane within the centra. Further observations on the osteology and behavior of this, and other *Urotheca* species may reveal this behavior to be widespread within the genus, and shed light on the anatomical details of this novel defense strategy.

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***XENOPELTIS UNICOLOR* (Asian Sunbeam Snake). DIET.** Prey of *Xenopeltis unicolor* include frogs, lizards, snakes, small mammals, birds, and even reptilian eggs (Rooij 1917. The Reptiles of the Indo-Australian Archipelago, vol. II. Ophidia. E. J. Brill, Leiden, Holland. 334 pp.; Bergman 1955. Zool. Mededelingen, XXXIII, No. 22:209–225; Martins and Rosa 2012. Taprobanica 4:48–51). Small skinks and snakes are possibly the most common species in the snake's diet and *X. unicolor* possesses specialized tooth morphology for handling lizard prey. On 13 March 2013 at 1945 h, in the northeastern part of Phi Phi Don, the largest island of Phi Phi Archipelago, Andaman Sea, Thailand (7.770845°N, 98.767326°E; datum WGS84), I discovered an adult *Xenopeltis unicolor* coiled around a live adult male *Kaloula pulchra* near a burrow on the pond shore in an area of secondary tropical forest. The frog may have been attacked and constricted on the pond's shore where numerous male *K. pulchra* congregate for breeding. The snake continued to constrict the prey for 10 min, during which the frog produced a creaking sound (Fig. 1). Upon capture, the snake released the frog, which was alive and appeared undamaged.

FIG. 1. An adult *Xenopeltis unicolor* found preying on a *Kaloula pulchra* on Phi Phi Don island, Andaman Sea, Thailand.

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