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NATURAL HISTORY NOTES

Instructions for contributors to Natural History Notes appear in Volume 37, Number 1 (March 2006).

CAUDATA

AMBYSTOMA TIGRINUM MAVORTIUM (Barred Tiger Salamander). **EXTRALIMITAL POPULATIONS**. The natural range of *Ambystoma tigrinum mavortium* extends from central Nebraska to south Texas, USA (Conant and Collins 1991. Reptiles and Amphibians Eastern and Central North America, Houghton Mifflin Co., Boston, Massachusetts). The common practice of using Tiger Salamander larvae (water dogs) as fish bait has resulted in introductions of *A. t. mavortium* beyond its natural range (Petranka 1998. Salamanders of the United States and Canada, Smithsonian Press, Washington 587 pp.).

We report extralimital populations of *A. t. mavortium* from the unincorporated communities of Alpine and Ramona, San Diego Co., California. We consider both populations to be established because of the documentation of larvae (Alpine) or recently transformed individuals (Ramona). Specimen vouchers from the Alpine population have been deposited in the herpetological collection of the California Academy of Science, San Francisco, California (CAS). Vouchers were also sent to H. Bradley Shaffer, Department of Zoology, University of California, Davis, California, for genetic analysis.

On 6 February 1996, *A. t. mavortium* larvae (ca. 30 mm TL) were first detected in the vicinity of upper Chocolate Canyon in the unincorporated community of Alpine (R2E T15S Sec 29). Subsequent surveys resulted in additional observations of *A. t. mavortium* larvae: Spring 1996 (ca. 35 mm TL); 16 March 2001 (ca. 25 mm TL; CAS 233270); 28 March 2003 (ca. 17 mm TL; CAS 233721); 4 April 2003 (ca. 35 mm TL; CAS 233274); 4 May 2003 (ca. 43mm TL); April 2004; and 12 March 2005 (ca. 50mm TL; CAS 233723). Three of the larvae collected in 2003 were maintained in aquaria and photographed 25 months later to determine the pattern and coloration of individuals representing this population. Additional locality records of *A. t. mavortium* within the town of Alpine include a surface-active adult taken during Winter 1994 (R2E T15S Sec. 32), another on 12 January 2005 (R1E T16S Sec. 11), as well as the excavation of an adult from a residential garden in Spring 1999 (R2E T15S Sec. 33). Although no specimens were collected from these three additional locations, both surface-active individuals were photo documented. The Alpine population is now known to occupy an area of both the San Diego River watershed having been found in the area of upper Chocolate Canyon, and the Sweetwater River watershed, occurring in an unnamed drainage along Harbison Canyon Road.

Additional records of *A. t. mavortium* within San Diego Co. include three individuals captured within a few meters of the West Branch drainage located southeast of the unincorporated community of Ramona (R1W T13S Sec. 36). In Spring 2002, an adult was captured, and during Spring 2003, on separate dates, a recently transformed individual and an adult were captured. Individuals were photo documented prior to being released at the places of capture. This population also occurs within the San Diego River watershed.

Due to the limited amount of information, aspects of these populations such as source of introduction, length of time as an established population, population size, and the extent of their distribution remain unresolved.

This note provides source information for the *A. tigrinum* population of Alpine, San Diego Co., represented on the range map (extreme southwest portion of mainland California) in Stebbins (2003. Western Reptiles and Amphibians, 3rd. ed., Houghton Mifflin Co., Boston, Massachusetts), as referenced in Jennings (2004. An Annotated Check List of the Amphibians and Reptiles of California and Adjacent Waters, California Dept. Fish and Game 90[4]:161–213), and in Lemm (2006. Field Guide to Amphibians and Reptiles of the San Diego Region. University of California Press. Berkeley, California).

We extend our thanks to Mark R. Jennings for making useful comments on this manuscript, and Carlton Rochester, Drew Stokes, Gale Bustillos, and Yolaine Stout for providing additional information for Alpine locations, and Kyle Icke, Rick Roedell, and Jim Davidson for the Ramona location.

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AMBYSTOMA TIGRINUM TIGRINUM (Eastern Tiger Salamander). **BURROW DESCRIPTION.** Relatively little is known about burrows of the Eastern Tiger Salamander (Semlitsch 1983. Can. J. Zool. 61:616–620; Madison and Ferrand III 1998. Copeia 1998:402–410; Gruberg and Stirling 1972. Herpetol. Rev. 4:85–89). During winter 2005, we radio-instrumented four *A. t. tigrinum* as they exited a breeding wetland in southwest Georgia, USA. In all instances, animals were tracked to underground burrows with one or more visible entrances. The area and depth of burrows were measured when we attempted to recover the transmitters; measurements varied considerably among individuals.

One radio-tagged female was located in a burrow seven days after release. The burrow was adjacent to an agricultural field and firebreak, and was 6 m from the base of a large live oak, *Quercus virginiana*. The burrow meandered through an area ca. 0.5 × 0.50 m and reached a maximum depth of 0.30 m. Only one entrance was found; the burrow terminus was an elliptical cavity.

A tagged male was also located seven days after release. It spent two days in a shallow, branched burrow network. Total burrow length was ca. 4 m with a total area of 1.0 × 3.5 m. Although most of the tunnels were shallow, the burrow reached a maximum depth of 0.20 m. There was no tree canopy over the burrow system and the burrow system was 13 m from the base of the nearest live oak. There were small oaks (*Quercus* spp.) in the area immediately surrounding the burrow.

A second tagged male was tracked to a burrow three days after release. It spent at least two days at this location and was observed once in the entrance of the burrow. The burrow was surrounded by shrubs and small oaks in the understory with a large, mature hardwood overstory. Burrow area was 1.0 × 1.5 m and was at least 0.40 m deep. The burrow led to a thick root bed.

The third tagged male was tracked to a burrow network the day after release and spent at least four days at this site. The burrow system was adjacent to a firebreak and agricultural field with little or no vegetation. The burrow network was shallow (< 3 cm) and covered an area 3.0 × 5.0 m with more than 10 different tunnels leading to openings at the surface. We tracked this animal over a 2 h period (2100–2300 h) in February and found that it moved throughout the burrow network.

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DESMOGNATHUS MONTICOLA (Seal Salamander) and ***DESMOGNATHUS QUADRAMACULATUS*** (Black-bellied Salamander). **INTRAGUILD PREDATION** (IGP) and **AUTOUROPHAGY**. Although experimental studies demonstrate that plethodontid salamanders are intraguild predators, there are few records from nature of interspecific predation by salamanders. A previous note (Bernardo 2002. Herpetol. Rev. 33:121) reported three distinct IGP interactions involving six different plethodontid species in the field. Here we document a fourth distinct IGP interaction involving a new pairing and one additional species. Upon arrival at a waterfall in Union Co., Georgia (USA) on 13 May 2005, we observed a large (ca. 70 mm SVL) *Desmognathus monticola* with what appeared to be its own recently autotomized tail in its mouth (Fig. 1). As we puzzled over this observation for a few moments, the salamander backed under a large rock into a burrow. We then noticed a freshly dead subadult *Desmognathus quadramaculatus* (ca. 40–50 mm SVL) about a meter away from where we had observed the *D. monticola*. The smaller individual had recently sustained significant injuries and was dead. It was missing its right hind limb, its tail, and it had a fresh bite mark along the left side if its trunk (Fig. 2); the bite penetrated the skin revealing musculature (circled in Fig. 2), and the wounds to the limb and tail were fresh and bloody. We presume that the missing body parts were consumed by the *D. monticola*, although we were unable to capture it. From these observations we conclude that the two salamanders had a predatory encounter. The larger individual also apparently sustained an injury causing it to autotomize its tail. Tail autotomy is common among salamanders during predatory interactions (Bernardo and Agosta 2005. Biol. J. Linn. Soc. 86:309–331). The other noteworthy feature of this interaction is the apparent retrieval and planned consumption of its own autotomized tail by *D. monticola*. Tail autotomy during predatory encounters has been shown to increase survival, but because tails are generally highly nutritious, tail loss also may impinge on reproductive phenotypes and other fitness components (Bernardo and Agosta 2005, *op. cit.*). Autourophagy permits recovery of these valuable resources when the predator fails to eat the tail. This behavior has been documented in lizards (e.g., Clark 1971. J. Exp. Biol. 176:295–302), but we are unaware of any records of tail recovery and ingestion by salamanders.

FIG. 1. Adult *Desmognathus monticola* consuming its own tail following a predatory event with a sub-adult *D. quadramaculatus*.

FIG. 2. Deceased sub-adult *Desmognathus quadramaculatus*, showing significant injuries apparently sustained during a predatory event with a larger *D. monticola*. Circled area denotes exposed musculature; note also missing left rear leg and tail.

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DICAMPTODON COPEI (Cope's Giant Salamander). **PREDATION.** *Dicamptodon copei*, restricted in distribution to western Washington and northwestern Oregon, is ecologically poorly known (Jones et al. 2005. Amphibians of the Pacific Northwest. Seattle Audubon Society, Seattle, Washington. 227 pp.). Few specific dietary data exist. Antonelli et al. (1972. Northwest Sci. 46:277–289) reported prey in 2 arachnid groups; 2 fish genera; 2 mollusc groups at an ordinal level; and 8 insect orders at a family level, including a gryllid orthopteran adult; but precisely which of these are *D. copei* prey is unknown because the data are a composite from *D. copei* and *D. tenebrosus*. In a general account, Nussbaum et al. (1985. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press, Moscow. 332 pp.) reported that *D. copei* "feed on almost all available aquatic organisms small enough to be ingested," adding that "immature insects form the bulk of the diet;" their comments on prey taxon specificity were restricted to the statement that "fish eggs, small fish, eggs and tadpoles of [Coastal] Tailed Frog (*Ascaphus truei*), and smaller larvae of their own kind and the Pacific Giant Salamander [*D. tenebrosus*] are also eaten." Hence, we augment the sparse species-specific dietary data on this species with an observation of *D. copei* from southwestern Washington with orthopteran prey.

On 12 Sept 2001 at 1459 h, DJD and RFP encountered a 73 mm SVL (13.5 g, 65 mm tail) paedogenic *D. copei* that was submerged under a cobble sitting on gravel in a small step-pool (30 cm max depth) in a small (0.6 m average width) headwater stream. The *D. copei* was found in a second-order reach in a late-rotation age Douglas-fir (*Pseudotsuga menziesii*) forest managed for timber in the Stillman Creek Basin, Willapa Hills (46°28'51.70"N, 123°12'45.67"W, WGS 84; elev. 639 m). When first found, the *D. copei* had part of an orthopteran hindlimb protruding from its mouth. In the process of handling the *D. copei* for measurement, the intact hindlimb was removed and found severed at the articulation point of the femur with the body. Viscous fluid clung to its severed end. We preserved the disarticulated leg and released the *D. copei* at its site of capture.

Identification of the orthopteran leg revealed it to be the left hind leg of a camel cricket, *Tropidischia xanthostoma* (Rhaphidophoridae; Orthoptera). Rhaphidophorids, a cosmopolitan family of hygrophilic omnivorous orthopterans with many cavernicolous species (Vandel 1965. Biospeleology—The Biology of Cavernicolous Animals. Pergamon Press, London, England. 524 pp.), are a group we have often observed in the coastal Pacific Northwest landscape. The orientation of the leg (head of the femur inside the salamander) leads us to believe that the *D. copei* ate the remainder of the cricket. This represents the first record of a *D. copei* consuming a rhaphidophorid cricket.

The Weyerhaeuser Company, through Douglas Runde, facilitated work on their lands, Washington Department of Fish and Wildlife funded the surveys, and David A. Nickel (Systematic Entomology Lab., Agriculture Research Service, USDA, Beltsville, Maryland) identified the cricket.

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DICAMPTODON TENEBROSUS (Pacific Giant Salamander). **DEFENSE.** In the Pacific Northwest, *Dicamptodon* spp. are the largest salamanders having both terrestrial and neotenic forms (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington and London. 587 pp.). They also are an important food source for garter snakes (*Thamnophis* spp.) which, as they grow in size, increasingly prey on larger salamanders (Lind and Welsh 1990. J. Herpetol. 24:104–106; Lind and Welsh 1994. Anim. Behav. 48:1261–1273). Although this behavioral trend is hypothesized to increase snake survival (Lind and Welsh 1994, *op. cit*), large terrestrial *Dicamptodon* spp. can pose a significant threat to predatory garter snakes. Diller (1907. Science 26:907–908) observed a terrestrial giant salamander firmly grasping the head of a garter snake with its jaws for several hours, which resulted in the death of the snake; and Graf (1949. Copeia 79–80) made a similar observation, but the snake was eventually released by the salamander. Here, we present a description of a terrestrial *D. tenebrosus* engaged in a fight with an adult California Red-sided Garter Snake (*Thamnophis sirtalis infernalis*) over a half-century since the last published report of a similar event.

On 14 April 2001 at 1500 h, in an old-growth redwood forest at Montgomery Woods State Park, Mendocino Co., California, USA (39°13'46.2"N, 123°23'22"W), SVS encountered a *D. tenebrosus* (ca. 17.5 cm TL) biting the head of a *T. s. infernalis* (ca. 75 cm TL, largest diameter ca. 3.75 cm). The salamander was biting the snake head-on, possessing the entire upper cranium posterior to the eyes and up to the dorsal stripe in its jaws. The snake's head was extremely flattened, disarticulated, and bloodied from the salamander's bite. Initially, the snake was vigorously thrashing side-to-side, coiling, and trying to pin the salamander to free itself. In response, the salamander moved and rolled with the action of the snake, righting itself every time without releasing its grip. By 1545 h the snake showed reduced activity, having spent much of its energy trying to escape the salamander, and was still bleeding profusely from the head. Following 45 min of observation, SVS left the area. At 1745 h, SVS returned to the area and found the salamander still maintaining its grip on the snake in the same position as first discovered. Although the snake was still alive, it was extremely lethargic and appeared close to death. Unfortunately, due to waning daylight, SVS departed the area and did not return to investigate the outcome of the fight.

We assume that antagonistic encounters like this occur as a result of snakes actively pursuing salamanders. Although formal accounts of interactions between *Thamnophis* spp. and terrestrial *Dicamptodon* spp. are few (Diller, *op. cit.*; Graf, *op. cit.*), we suspect these types of events are probably common, though rarely observed. Most accounts of active predation of *Dicamptodon* spp. by *Thamnophis* spp. have been largely relegated to larval or neotenic salamanders occupying aquatic habitats where they occur at high densities and are more readily observed (Lind and Welsh 1990, 1994, *op. cit.*). Future demographic research on giant salamanders is needed to better understand their terrestrial ecology and interactions with potential predators such as garter snakes.

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PLETHODON VEHICULUM (Western Red-backed Salamander). **REPRODUCTION**. On 2 Aug 2002, we found a nest of the Western Red-backed Salamander, *Plethodon vehiculum*, 80 m from the southern bank of the lower Pachena River (48°48'25"N, 125° 06'28"W), in a Sitka Spruce floodplain forest (> 250 years old), ca. 4 km from the town of Bamfield, Vancouver Island, British Columbia. While searching for earthworms, we dug with our hands into loose moss, litter, and humus at the base of a decayed tree stump. We uncovered a clutch of 12 eggs within a small hollow created by the root of a hemlock sapling and a piece of decayed wood (12 × 5 × 1.5 cm) about 10 cm under the surface. The grape-like cluster of eggs was enclosed in a gelatinous membrane with a stalk attached to the underside of the wood. We noted the presence of an adult who crawled further underground before we could verify its identity. We quickly replaced the nest to its original position.

We revisited the site on 19 Aug 2002 to photograph the nest (photographs of the nest and accompanying adult were deposited in the Royal British Columbia Museum image database). We estimated adult SVL to be > 50 mm but did not handle the individual for exact measurements. The large size suggests that the adult was likely a female. Eyes and small legs were visible within each egg. One egg was 0.56 cm in diameter. On 29 Sept 2002, we returned to the site and found only a small gelatinous lump on the wood. The substrate appeared as we had left it.

This nest description is noteworthy for two reasons. First, only two other natural nests of *P. vehiculum* have been documented in the literature. They were found 12 cm apart beneath a rock (40 × 30 × 15 cm) in talus at the base of a shear roadside basalt outcrop near Klickitat Lake, Oregon (Hanlin et al. 1979. J. Herpetol. 13:214–216). Leonard et al. (1993. Amphibians of Washington and Oregon. Seattle Audobon Society, Seattle. 168 pp.) suggested that nests and eggs of *P. vehiculum* are not well documented because most egg clutches are probably located well beneath the surface. The nest that we found was at a shallow depth under humus and wood, where it would be considerably more vulnerable to predation, desiccation, and soil compaction than would eggs in deeper nest sites. Second, this clutch of 12 eggs is notably larger than the clutches of 8 and 9 reported by Hanlin et al. (1979, *op. cit.*) and the clutch of 9 laid by a captive female (Stebbins 1951. Amphibians of Western North America. Univ. California Press, Berkeley. 539 pp.). It is within the high end of the range reported for ovarian clutches (6–19 eggs per clutch; mean = 10.43; N = 65) for the species in Oregon (Peacock and Nussbaum 1973. J. Herpetol. 7:215–224). The adult associated with the nest was within the range of females measured on Vancouver Island (42–58 mm SVL; Ovaska and Gregory 1989. Herpetologica 45:133–143).

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PSEUDOTRITON RUBER RUBER (Northern Red Salamander). **SIZE AND SUBTERRANEAN AGGREGATION**. Conant and Collins (1998. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed., expanded. Houghton Mifflin, Boston. 616 pp.) reported 181 mm total length (TL) as the maximum size for *Pseudotriton ruber ruber*. Herein, we report an aggregation of exceptionally large *P. r. ruber* from a cave, many approaching the reported maximum size.

On 20 October 2005, 14 *P. r. ruber* were discovered in Anderson Spring Cave, a state-owned cave on Pigeon Mountain, Walker Co., Georgia, USA. All individuals were found underneath rocks in the cave stream, ca. 25–75 m beyond the twilight zone. Water depth of the stream ranged from 2–10 cm. Thirteen individuals were captured, measured to the nearest mm using a metric rule, and weighed to the nearest 0.5 g using a Pesola scale. The largest individual measured 113 mm SVL, 180 mm TL, and weighed 27.0 g. Three other individuals exceeded 110 mm SVL, 175 mm TL, and 25.0 g. Mean size ± 1 SD for the 13 captured individuals was 102.7 ± 7.6 mm SVL, 164.8 ± 11.1 mm TL, and 19.7 ± 4.4 g mass. The smallest individual from Anderson Spring Cave (92 mm SVL, 155 mm TL, 17.0 g) was larger than the largest individual (female 85 mm SVL) out of 316 specimens collected by Bruce (1978. Copeia 1978:417–423) in the southern Blue Ridge of North Carolina. A voucher photograph was taken of the largest individual and placed into the Herpetological Collection at Austin Peay State University (APSU 18055).

Female *P. ruber* grow larger than males (Bruce 1978, *op. cit.*); however, sex is difficult to determine externally. During autumn, females disappear from surface sites, presumably to brood eggs, and are not observed on the surface until late autumn or winter (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Inst. Press, Washington, DC. 587 pp.). Although adults are common in headwater springs and seeps (Hunsinger 2005. *In* M. Lannoo [ed.], Amphibian Declines: The Conservation Status of United States Species, pp. 860–862. Univ. of California Press, Berkeley and Los Angeles), *P. ruber* has infrequently been reported from caves. The salamanders observed in Anderson Spring Cave may represent a breeding aggregation of exceptionally large females. Males may also be present within the aggregation. The two largest individuals from Anderson Spring Cave were found brooding separate egg masses beneath the same rock, and another large female had ova visible through her venter. Communal nesting has not been documented in *P. ruber*, although Miller and Niemiller (2005. Herpetol. Rev. 36:429) observed presumably two females brooding an egg mass in the twilight zone of a cave stream in DeKalb County, Tennessee, in September 2004. Walker (1931. *In* Pfingsten and Downs 1989. Salamanders of Ohio. Ohio Biol. Surv. Bull. New Series Vol. 7 No. 2. 315 pp.) discovered 22 adults on 24 March within a few square meters in a spring in Knox County, Ohio, and suggested that the concentration may have been related to hibernation. Rather than hibernation, we suggest the aggregation may have been related to reproduction.

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ANURA

ACRIS CREPITANS BLANCHARDI (Blanchard's Cricket Frog). **MORPHOLOGY.** Cricket Frog dorsal background color varies from light to dark gray or from light tan to dark reddish-brown (Milstead et al. 1974. Evolution 28:489–491). The vertebral stripe of *A. crepitans* is polymorphic, and can be a varying shade of red (red, brown, reddish brown), green, or gray (Pyburn 1961. Southwest. Nat. 6:164–167). According to Nevo (1973. Evolution 27:353–367), gray is most frequent, followed by red, and then green.

Some *A. crepitans* lack the prominent vertebral stripe and have completely green dorsal surfaces (Gray 1995. Trans. Illinois State Acad. Sci. 88:137–138; L. M. Blackburn, pers. comm.). This rare color pattern was observed during May–August 2004 and May–August 2005 at a semi-permanent wetland at Ford Lake Park in Ypsilanti, Michigan, USA. The *A. c. blanchardi* found at Ford Lake Park were similar to the specimens reported by Gray (1995, *op. cit.*): the green dorsal surface color was brighter than the olive or tan background color, and covered the head, body, limbs, and feet. About 76% (13/17) of the Cricket Frogs captured at Ford Lake Park exhibited this green color pattern. The wetland at Ford Lake Park has more emergent vegetation, which might provide a green color pattern background that matches the green dorsal surface of these Cricket Frogs. Cricket Frog coloration might be an adaptation to predation, as coloration that matches substrate color allows Cricket Frogs to vanish as soon as they stop moving (Milstead et al. 1974. *op. cit.*). Nevo (1973. *op. cit.*) suggested that color morph frequency might differ between neighboring microhabitats based on substrate color. Frequencies of red and green morphs varied significantly with the substrate color of the pond, which could be due to selective predation and/or habitat selection by morphs (Nevo 1973. *op. cit.*). To the best of my knowledge, this is the first recorded account of the green color pattern variant in Blanchard's Cricket Frogs in Michigan.

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ACRIS CREPITANS BLANCHARDI (Blanchard's Cricket Frog) **PREDATION.** Known predators of the Northern Cricket Frog (*Acris crepitans*) include frogs, fish, snakes, turtles, birds, and mammals (Gray and Brown. 2005. *In* Lannoo [ed.], Amphibian Declines: The Conservation Status of United States Species, pp. 47–54. University of California Press, Berkeley). The only previously recorded anuran predator of *A. crepitans* is the American Bullfrog (*Rana catesbeiana*) (Lewis 1962. Trans. Illinois State Acad. Sci. 55:80–83). Here I report predation of a juvenile Blanchard's Cricket Frog (*Acris crepitans blanchardi*) by an adult Green Frog (*Rana clamitans*). To the best of my knowledge, this represents the first record of predation by a *R. clamitans* on a Cricket Frog.

Although *R. clamitans* are commonly associated with *A. crepitans*, there are no published records of Green Frog predation on Cricket Frogs (Hay 1998. *In* Lannoo [ed.], Status and Conservation of Midwestern Amphibians, pp. 79–82. University of Iowa Press, Iowa City). Green Frogs eat insects, slugs, snails, crayfish, spiders, flies, caterpillars, butterflies, moths, small snakes, and frogs (Jenssen 1967. Copeia 1967:214–218). I observed an adult *R. clamitans* capture and consume a juvenile *A. c. blanchardi* on 17 Aug 2005, between 1530–1540 h along the shoreline of a permanent wetland at the Port Huron State Game Area in Port Huron, Michigan, USA. Although I noticed the legs of the *A. crepitans* dangling from the mouth of the *R. clamitans*, I did not notice a struggle by the Cricket Frog to free itself. After capturing the Cricket Frog in its mouth, the Green Frog jumped away and consumed its prey. The Blanchard's Cricket Frog is declining at an alarming rate in the northern portions of its range, and the exact cause of this decline is unknown (Harding 2000. Amphibians and Reptiles of the Great Lakes Region. Univ. Michigan Press, Ann Arbor). Hay (1998, *op. cit.*) speculates that the association between *R. clamitans* and *A. crepitans* might be partially responsible for Cricket Frog declines. Information on predators and Cricket Frog mortality can assist researchers in determining the cause of these declines and suggest management techniques to conserve the species.

Thanks to Ernie Kafcas at the Michigan Department of Natural Resources for access to Port Huron State Game Area.

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ALSODES GARGOLA (Rana del Catedral). **PREDATION.** Predation by Odonata naiads on anuran larvae is a major cause of tadpole mortality (Heyer et al. 1975. Biotropica 7:100–111). However, it has not been reported under natural conditions on anurans of Patagonia. Here we present the first record of predation by Odonata naiads on tadpoles of the frog *Alsodes gargola*, which is endemic to northwest Patagonia, Argentina. *Alsodes gargola* inhabits oligotrophic high altitude lakes and mountain streams (200–2000 m elev.). Adults and juveniles are highly aquatic, although they may also live in terrestrial environments near water. *Alsodes gargola* tadpoles have a long larval period and overwinter at least one year (Logares and Úbeda 2004. Herpetol. Rev. 35:368–369), therefore the species is only associated with permanent aquatic environments, where different tadpole cohorts typically coexist.

During a study of the *A. gargola* tadpole population (2004–2005) in aquatic mountain environments in Nahuel Huapi National Park, Río Negro Province, Argentina, we monitored the population in a stream in Valle de los Perdidos (41°14'32"S; 71°16'7"W, 1375 m elev.), surrounded by a mosaic of deciduous *ñire* (*Nothofagus antarctica*) thicket, altitudinal steppe, and hygrophilous meadow (*mallín*). The normal regional rainfall pattern causes this stream to carry noticeably less water towards the end of the austral summer. In April 2005 (austral autumn) it began to rain later than usual and the level of the stream dropped so far that its flow was interrupted, forming long, isolated pools of water where the tadpole population was temporarily confined. On 2 April, many of the tadpoles showed signs of attack on their bodies. No evidence of predation had been recorded previously. Various nymphs of *Rhionaeschna variegata* Fabricius (Odonata, Anisoptera, Aeshnidae) naiads, measuring 8–35 mm, were found in the pools. *Rhionaeschna variegata* is the most ubiquitous, widely distributed Anisoptera species in Patagonia. It is found to Tierra del Fuego, where it is the only Odonata species (Muzón 1995. Rev. Soc. Entomol. Argent. 54:1–14). Exuvia were found on the shore, providing evidence of recent metamorphosis. Tadpoles from two isolated pools were analyzed: Pool 1 (length 2.3 m; max. mean depth 0.33 m; volume 2.1 m^3) and Pool 2 (length 4.3 m; max. mean depth 0.61 m; volume 1.3 m^3). The entire tadpole population was sampled at the beginning of austral summer (23 Dec 2004) and the beginning of austral autumn (2 April 2005). The total length of each tadpole was measured and the developmental stage determined (Gosner 1960. Herpetologica 16:183–190). The percentage of injured tadpoles was calculated, and the location of the injuries on the body recorded (tail vs. head-trunk). For each pool, initial abundance (N_0) and final abundance (N_1) data were used to calculate mortality $[(N_0-N_1)/N_0]\times 100$.

To confirm these attacks, *R. variegata* naiads (14–35 mm) and *A. gargola* tadpoles (40–66 mm) were returned to the laboratory, and after acclimatization for 48 h at 18°C, were placed in different combinations of sizes in polyethylene containers containing dechlorinated water and suspended roots of stream plants. Observations were made for 7 full days, at a constant temperature of 18°C and a natural light-and-dark regime.

In the laboratory, the tadpoles placed in the containers with the naiads did not exhibit evasive behavior or avoid contact. After 36 h, all naiads larger than 26 mm repeatedly attacked tadpoles of all sizes, and this behavior persisted throughout the period of observation. The most active times were dawn and dusk. The tadpoles managed to escape from most attacks, although they were sometimes injured. Injuries of the abdomen were always fatal, while no attack on the tail led to tadpole death. Naiads fed first on the tadpole abdomen. Large naiads (≥ 34 mm) succeeded in killing large tadpoles (66 mm). The remaining carcasses (remains of cartilage and musculature) and the type of injuries observed allow us to assume that the carcasses observed in the field were the result of naiad predation. In the laboratory, the *Rhionaeschna variegata* naiads were noticeably voracious, and able to attack and eat tadpoles twice their size, using the "sit and wait" hunting strategy (resting concealed in submerged vegetation waiting for the prey to pass) which is typical of this species (Gullan and Cranston 1994. The Insects. An Outline of Entomology. Chapman and Hall, London, 491 pp.).

The tadpoles collected were at stages 25–40 (Gosner, *op. cit.*), and belonged to different cohorts. In Pool 1, we counted 113 tadpoles during the first sampling (density: 55 tadpoles/m^3), and 90 at the second sampling (density: 45 tadpoles/m^3). In addition, 215 newly hatched tadpoles were recorded. In Pool 2, we counted 66 tadpoles at the first sampling (density: 51 tadpoles/m^3), and 28 at the second sampling (density: 21 tadpoles/m^3). There was no recruitment of new larvae. During the second sampling (austral autumn), tadpoles of all stages showed signs of attack with recently inflicted, bleeding injuries or injuries in the process of healing. Mortality in the population attributable to naiad predation was 20.3% in Pool 1 and 57% in Pool 2, over a period of 101 days. In Pool 1, 62 tadpoles (20.3 %) had injuries: 61 on the tail and only 1 on head-trunk. In Pool 2, 17 tadpoles (60 %) had injuries: 8 on the tail and 9 on head-trunk. On two visits to the site, 14 and 21 days later, fewer naiads were found perching on the submerged roots, and exuvia were found outside the water. Many of the injured tadpoles were found to have healed completely, judging from the presence of whitish scar tissue.

Because of its long larval stage, *A. gargola* is limited to permanent water bodies. In its pristine environments, the species has no native vertebrate predator. Furthermore, in its alpine aquatic environments (above the tree line) no arthropod predator is known. However, in streams at lower altitudes, *A. gargola* tadpoles might coexist with Odonata naiads. When these streams carry a normal amount of water, attacks must be rare, judging by the lack of injured tadpoles observed. But under exceptional environmental conditions, such as the ones reported here (summer–autumn drought), which leads to atypical confinement in still waters, there is a greater likelihood of *A. gargola* tadpoles encountering *Rhionaeschna variegata* naiads, and the tadpoles become highly vulnerable to predation. Thus, during very dry years, the tadpole population confined to pools may face high levels of predation, and suffer high percentages of mortality. These are the only losses recorded for *A. gargola* in pristine environments (without exotic fish species).

Further studies are needed to elucidate the atypical though intensive role of predation by Odonata naiads as predators in the dynamics of the *A gargola* tadpole population in streams subject to large fluctuations in the flow of water or during exceptionally dry years.

We thank J. Muzón and M. Kun for identifying the Odonata naiads.

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APLASTODISCUS ARILDAE (Green Tree Frog). **PREDATION.** Spiders might be among the most important predators of frogs (Hayes 1983. Biotropica 15:74–76). Numerous reports have been published on members of the family Pisauridae (*Thaumasia* and *Dolomedes*) feeding on adult hylid frogs (Bastos et al. 1994. Herpetol. Rev. 25:118; Pramuk and Alamillo 2002. Herpetol. Rev. 33:46–47; Marra et al. 2003. Herpetol. Rev. 34:55; Jeffery et al. 2004. Herpetol. Rev. 35:158). These spiders are often found near watercourses, a habitat shared with members of the closely related family Trechaleidae (Carico 1993. J. Arachnol. 21:226–257). On 20 Nov 2005 at 2320 h in Serra do Japi (23°11'S; 46°52'W; 1030 m), municipality of Jundiaí, State of São Paulo, Brazil, an adult female trechaleid spider (*Trechaleoides biocellata*) was observed on rocks close to the water and 1.2 m from a male *Aplastodiscus arildae* (SVL 35.6 mm; mass 2.3 g). The treefrog was calling on a leaf of a bush 1.1 m high at the edge of a stream. Forty- five minutes later, the same spider was found with the frog partially digested in its chelicerae at the same site where the frog was observed earlier. A voucher specimen of *T. biocellata* collected at the same site was deposited in the spider collection of Instituto Butantan, São Paulo, SP (IBSP 59522).

We are grateful to FAPESP (Proc. 01/13341-3) and CAPES for financial support.

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ATELOGNATHUS PATAGONICUS (Rana Acuática de Laguna Blanca). **OVERWINTERING TADPOLES.** Only one anuran species (*Alsodes gargola*) from Patagonia, Argentina has been reported to have tadpoles overwinter (Logares and Ubeda 2004. Herpetol. Rev. 35:368–369). Herein we report overwintering tadpoles of *Atelognathus patagonicus,* an endangered anuran from the northwest Patagonian steppe of Argentina. This semi-aquatic frog is endemic to the endorrheic wetland system of Laguna Blanca National Park and surrounding areas (Neuquén Province, Argentina). *Atelognathus patagonicus* is extinct from the largest lake in the system (Laguna Blanca, 1780 ha), restricting its presence to 21 neighboring smaller bodies of water (surface area between 0.5 and 60 ha). The objective of this study was to compare monthly overwintering tadpole stages in the most representative microhabitats of a permanent pond.

From January to December 2004 we studied the larval phenology of *A. patagonicus* in a permanent lagoon, Laguna Verde (20 ha) and in a temporary pond, Laguna Batea (2 ha). Both are located in Laguna Blanca National Park and close to Laguna Blanca. Overwintering tadpoles were only detected in the permanent lagoon (Laguna Verde, 39°00'28"S, 70°23'07"W; elev. 1250 m). During the winter, Laguna Verde is characterized by the presence of ice, with frequent snowstorms and southwest wind gusts to 140 km/h. Annual rainfall is < 360 mm and the most extreme air temperatures recorded were -23°C in July 2000 and 34.5°C in February 2002 (period 1999–2003).

The following results were obtained from June to August 2004, when the harshest winter climatic conditions and the lowest temperatures were reported. Water temperature was recorded every hour using a Data Logger Hobo Water Temp Pro and data were analyzed using Box Car Pro 4. The minimum mean monthly water temperature was recorded in July (2.8°C). The shoreline was sampled selecting the most representative microhabitats: a) coarse fragments (gravel, boulder and bedrock), b) mix (gravel and sand), and c) fine sediment (dominated by sand). Tadpoles were captured using aquatic funnel traps (30 cm long and 11 cm diam), and body length and Gosner stage was determined (Gosner 1960. Herpetologica 16:183–190). All tadpoles were returned unharmed to their original capture site. Traps were placed parallel to the shoreline at 20–80 cm depth with 5 m interval between each one in each microhabitat. Because of the harsh climatic conditions, the number of traps set per month and per microhabitat differed (June = 90 traps/total, 30 traps/microhabitat; July = 39 traps/total, 15 traps/microhabitat a and c, and 9 traps/microhabitat b; August = 42 traps/total, 15 traps/microhabitat b and c, and 12 traps/ microhabitat a. Traps were left in place overnight.

During the entire study, 114 *A. patagonicus* tadpoles were captured at Gosner Stage 35–41 (Gosner 1960, *op. cit.*), which included individuals belonging to two cohorts (embryos hatching during early and late summer). No differences were found in the Gosner stage between months ($\chi^2 = 0.63$, 2 df, P = 0.73). Total length of the entire series ranged from 21–31.6 mm SVL; mean body length was 26.16 ± 0.5 mm. Captures were more abundant in July (N = 63; mean/trap = 1.61) than June (N = 12; mean/trap = 0.13) or August (N = 39; mean/trap = 0.93). Significant differences in the number of individuals by microhabitat ($\chi^2 = 65.27$, 4 df, P <0.001) and no differences in the stages between each microhabitat ($\chi^2 = 1.00$, 2 df, P = 0.61) were found. Tadpoles were more abundant in microhabitat a (N = 88; mean/trap = 1.54) than in microhabitat b (N = 20; mean/trap = 0.37) and than in c (N = 6; mean/trap = 0.13).

Few published observations of overwintering tadpoles come from the Northern Hemisphere and there is only one published account in southern South America (Logares and Úbeda, *op. cit.*). Herein we report the first data for overwintering tadpoles in relatively low altitudes of the Patagonia steppe, Argentina. *Atelognathus patagonicus* tadpoles showed two overwintering cohorts, suggesting that individuals can metamorphose at two different rates. Despite the extreme climatic conditions of winters, Patagonian steppe summers are almost four months long, allowing tadpoles to take advantage of the high seasonal productivity during warm summers. As in other amphibians, the ability of larvae to overwinter could be an adaptation to the harsh climatic conditions that characterize the Patagonian steppe.

This information is important because of the paucity of natural history data for this species (Cuello 2002. *Atelognathus patagonicus* (Anura, Leptodactylidae): distribución, hábitat, fenología y estado de conservación en el Parque Nacional Laguna Blanca y sus alrededores. Licenciature Thesis, Univ. del Comahue, Bariloche, Argentina 87 pp.; Fox et al. 2005 Copeia 2005:921–929) and its conservation status. *Atelognathus patagonicus* is listed as Endangered (IUCN 2004) and "In danger of extinction" (Secretaría de Medio Ambiente, Argentina, 2004).

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BARYCHOLOS TERNETZI (Chimbo Frog). **PREDATION.** Amphibians are common prey for a great variety of vertebrates, arthropods, and even carnivorous plants (Duellman and Trueb 1986. Biology of Amphibians. McGraw-Hill, New York; Pough et al. 1998. Herpetology. Prentice-Hall, New Jersey). Members of

FIG. 1. An adult *Barycholos ternetzi* being preyed upon by a juvenile water bug *Lethocerus* sp. in a stream at the Floresta Nacional de Silvânia, State of Goiás, Brazil.

the family Belostomidae are predaceous aquatic insects from medium to large size, that colonize many types of aquatic habitats in tropical and temperate regions (Lauck and Menke 1961. Ann. Ent. Soc. Amer. 54:644–657). Here, we report the predation of an adult frog, *Barycholos ternetzi*, by a nymph of a water bug (*Lethocerus* sp.).

On 14 Oct 2005 at 2130 h, in a stream at the Floresta Nacional de Silvânia, State of Goiás, Brazil, a juvenile water bug was observed jumping toward an adult *B. ternetzi*. When the water bug was disturbed by our presence, it captured the frog and dove into the water to a depth of ca. 15 cm. Submerged in the water, the water bug remained grasping the frog from its ventral region (Fig. 1), which was trying to escape. A digital photograph was deposited with the Laboratory of Animal Behavior of the Universidade Federal de Goiás.

We thank Cynthia P. de A. Prado and Lorena D. Guimarães for comments on this manuscript.

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BUFO NEBULIFER (Coastal Plains Toad). **URBAN ROAD MORTALITY**. Although motorways may affect wildlife populations investigators have performed few studies on the road mortality of wildlife (Lode 2000. J. Human Environ. 29:163–166), especially herpetofauna. The numbers of wildlife casualties on roads and railways have consistently grown as traffic, vehicle speeds, and their infrastructure networks have increased (Seiler et al. 2004. Wildl. Biol. 10:183–191). Amphibians and reptiles tend to be particularly susceptible to the ecological effects of roads (Forman and Alexander 1998. Ann. Rev. Ecol. Syst. 29:1–207). Road mortality along a 3.6 km section of a two-lane paved road adjacent to Big Creek National Wildlife Area on Lake Erie frequently included numerous amphibians (7 species, 30,034 individuals) and reptiles (10 species, 864 individuals; Ashley and Robinson 1996. Can. Field Nat. 110[3]:403–412). In most previous studies of road mortality, the roads crossed or were in some way associated with natural areas, thus providing significant data associated with large populations of amphibians and reptiles.

The Bowie Co., Texas study site was adjacent to Texas A&M University-Texarkana and Texarkana College on Virginia St. and Coolidge St. in Texarkana. Both paved, heavily trafficked, two-lane city-streets run parallel with, adjacent to, and approximately equidistant from Cow Horn Creek (a small stream that traverses Texarkana and receives much urban runoff). These streets differ in that Coolidge St. is lined by a subdivision on the side opposite Cow Horn Creek. Virginia St. is lined by a grassy field and the immediate area provides more habitat for wildlife. The roads were surveyed on foot for amphibian and reptile mortality on a 1.6 km stretch of Virginia St. on 1, 7, 14, 17, 20, and 28 June 2005. A 1.6 km stretch of Coolidge St. was surveyed on 17, 20, and 27 June 2005. Mean ambient temperature during surveys was 30.5°C (SD = 6.44). Data were tabulated and analyzed using MiniTab 13.30 Statistical Software (MiniTab, Inc., State College, Pennsylvania). This study is the first to examine *Bufo nebulifer* road mortality associated with movements to and from a breeding chorus.

Bufo nebulifer (N = 57) was the only species associated with road mortality in this study. Mortality data were normally distributed (Anderson-Darling: $A^2 = 0.604$, $P = 0.080$). Road mortality appeared higher on Virginia St. (N = 53, mean = 8.83 toads/survey, SE = 3.40) than on Coolidge St. (N = 4, mean = 1.33, SE = 1.33), but these differences were marginally significant (Two-sample T-test: $t = -2.05$, $df = 6$, $P = 0.086$; Neter et al. 1996. Applied Linear Statistical Models, 4th ed. McGraw-Hill. Boston, Massachusetts). The condition of specimens after mortality made sex determination difficult to impossible in most cases.

These data stimulate speculation regarding the influence of human habitation on habitat use by amphibians, particularly *B. nebulifer*. These data also suggest that *B. nebulifer* was originating from and returning to the grassy fields when mortality occurred. This implies that the breeding chorus in Cow Horn Creek was composed mostly of individuals originating from the grassy fields and that this habitat is important for the survival of this species in the immediate area. To deduce what influences undeveloped grassy fields and similar habitats occurring in urban environments have on sustaining urban populations of *B. nebulifer* and other herpetofauna will require more extensive studies.

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BUFO WOODHOUSII (Woodhouse's Toad). **SURVIVAL.** Records that demonstrate maximal natural longevity are virtually nonexistent for anurans, or amphibians in general. Records from captive specimens have demonstrated longevities as high as 36 yr for *Bufo bufo* (Duellman and Trueb 1986. Biology of Amphibians. McGraw-Hill Book Co., New York. 670 pp.). Here, we describe the longevity of a wild *Bufo woodhousii* that was initially monitored in 1978 (Engeman and Engeman 1996. Northwest. Nat. 77:23; Engeman and Engeman 2003. Northwest. Nat. 84:45), including 9 yrs of records on its emergence from hibernation (Engeman and Engeman 1996. *op. cit.*). The toad first appeared as an adult in 1978 in a basement window well of a home in suburban Denver, Colorado. It was observed alive every year to 2003 when in July it was observed dead in the window well of undetermined cause. Given that the toad was an adult when first observed, and that it was observed alive in 26 successive years, implies the toad was at least 27 years old at the time of its death. This toad was not a captive specimen, but the window well site in which it lived probably offered protection from most potential predators and also probably provided reliable arthropod food sources and moisture, thereby imparting optimal circumstances for maximal longevity. We could not find reference to a greater longevity for a wild amphibian.

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COPHIXALUS ORNATUS (Ornate Nursery Frog). **CHYTRIDIOMYCOSIS.** Chytridiomycosis is an emerging infectious disease that has been linked to amphibian population declines worldwide (Berger et al. 1998. Proc. Natl. Acad. Sci. 95:9031–9036). The chytrid fungus *Batrachochytrium dendrobatidis*, causative agent of chytridiomycosis, has an incredibly broad host range: it is currently known to infect over 150 amphibian species spanning two orders and 14 families (Speare and Berger 2004. www.jcu.edu.au/school/phtm/PHTM/frogs/chyglob.htm, updated with recently published accounts). Only seven of these species, however, are direct developers that bypass the free-swimming tadpole stage (*Eleutherodactylus cruentus, E. emcelae, E. melanostictus, E. karlschmidti, E. saltator, E. coqui, Leiopelma archeyi*). Tadpoles are thought to be an important life stage with respect to disease transmission: they stand a high chance of being exposed to the fungus' aquatic zoospores, and they do not succumb to chytrid infections, making them likely disease reservoirs (Daszak et al. 1999. Emerg. Inf. Dis. 5:735–748). Currently, there are no records of chytridiomycosis in Australian direct-developing frog species.

On 23 Sept 2005, KMK captured a male *Cophixalus ornatus* (Microhylidae) that was calling while perched on a leaf 2 m from the edge of Babinda Creek (70 m elev.), in Queensland, Australia. KMK firmly ran a cotton swab over the frog's dorsum, ventrum, sides, thighs, and the webbing of its feet, and used quantitative PCR (Boyle et al. 2004. Dis. Aquat. Org. 60:141–148) to test for the presence of *Batrachochytrium dendrobatidis*. Thirty-one chytrid zoospores were detected on the swab. This represents the first record of chytridiomycosis in an Australian direct-developing frog species, and only the eighth record worldwide.

There are no published reports of population declines in *C. ornatus*, a species whose large geographic range encompasses the localities of many of north Queensland's recent amphibian declines and disappearances, including that of *Taudactylus acutirostris* (the last known individual of which died of chytridiomycosis in 1995; Wright et al. 2001. J. Herpetol. Med. Surg.). Our finding of chytridiomycosis in *C. ornatus* supports the hypothesis that while all frog species might be exposed to the disease, there are ecological differences among sympatric species that might lead to different disease outcomes, ranging from no effect on the population to mass mortality events and local extinctions (Daszak et al. 1999, *op. cit.*; Hero et al. 2005 J. Zool. Lond. 267:221–232).

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CRINIA SIGNIFERA (Eastern Froglet). **REPRODUCTION.** Multiple males simultaneously in amplexus with the same female is rarely reported in anurans. One of the species in which this behaviour is well documented is the quacking froglet *Crinia georginia* (Roberts et al. 1999. Anim. Behav. 57:721–726). Here I report multiple male amplexus for another member of the genus. *Crinia signifera* is the most widespread and abundant frog in eastern Australia. The observation reported here was made in wet subalpine flat heathland in the Thomsons Run area of the Mount Baw Baw Plateau on the 18 Nov 2003. Morning conditions had been clear and sunny, however by the time the amplexing frogs were found, conditions were cloudy and cool.

At ca. 1400 h a female *C. signifera* was observed on the surface of a pool in a sphagnum bog. Upon noting my presence, she attempted to dive into the detritus at the bottom of the pond. She could not dive successfully and upon closer examination two males were found to be clasping her. The first male was in inguinal amplexus, while the second male was clasping in a slightly lateral position with one arm around the hind leg of the female and other arm around the body of the first male. Both males were approximately the same size while the female was at least twice as large. The trio was observed for ten minutes after which they were disturbed and the second male released his hold and dove into the detritus. There were numerous eggs on the base of the pond where the female was first observed. I did not observe any further instances of multiple male amplexus in the remaining 13 days of fieldwork, although amplexing pairs were observed on three other occasions. Upon conversation with other workers it was mentioned that they had also observed instances of multiple males amplexing one female (Woodford, pers. comm.; Hollis, pers. comm.).

Multiple males in amplexus with a single female have not previously been reported in C. *signifera*. Two factors could potentially increase the likelihood of this behaviour occurring in high altitude populations. First this observation was made at peak breeding time for *C. signifera* on the Mt. Baw Baw Plateau. Four weeks earlier the area had been covered in snow, while several weeks later the number of frogs observed was clearly reduced. By mid December the ponds in the sphagnum bog had begun to dry up. This explosive breeding pattern may increase the potential for multiple males to be in the close proximity with single females. Secondly, the diurnal breeding behaviour of highland *C. signifera* may also increase the probability of males seeing females. Conversely, diurnal breeding may simply increase the potential for the behaviour to be noted by observers.

I thank Greg Hollis and Luke Woodford for their information, and P. Doughty for comments.

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ELEUTHERODACTYLUS JOHNSTONEI (Johnstone's Whistling Frog). **HABITAT**. An increasing number of reptile and amphibian species have been documented to take advantage of the novel habitat provided by human night lighting (e.g., Perry and Lazell 2000. Herpetol. Rev. 31:247). Nonetheless, information is lacking for most species. Only one species of *Eleutherodactylus* is known to utilize the night-light niche (Henderson and Powell 2001. Carib. J. Sci. 37:41–54). *Eleutherodactylus johnstonei* is associated with humans in the Netherlands Antilles (Powell et al. 2005. The Reptiles and Amphibians of the Dutch Caribbean: St. Eustatius, Saba, and St. Maarten. St. Eustatius National Parks

Foundation, St. Eustatius, Netherlands Antilles), but has not previously been reported foraging at artificial lights.

At 2000 h on 5 Oct 2005, following several very rainy days, I observed a number of frogs arrayed around solar-powered trail lights on Saba, Netherlands Antilles. The observation was made at the Ecolodge Hotel (ca. 500 m elev.). Darkness had fallen ca. 1 h earlier, and a light rain was falling. Frog vocalizations were very loud, and many individuals were active on the vegetation. However, few frogs were occupying unlit lights, which were interspersed with the lit ones. A survey of all lights at the hotel identified 9 lit and 24 unlit trail lights, all solar. Despite being rather dim, the lights were attracting numerous small insects that were perched on or flitting about them. Lit units had 0–7 frogs on them (mean = 3.0, SD = 2.87). In contrast, unlit lights only had 0–3 frogs (mean = 0.3, SD = 0.76), a statistically significant difference (Mann-Whitney U = 47.5, Z = 2.919, p = 0.004). In addition, a brighter fluorescent light located at a height of about 2 m on the back of the hotel restaurant had ca. 30 frogs arrayed near it, an occurrence which hotel staff reported to be common.

Support for this project was provided by Texas Tech University, the Sea and Learn Program, and Ecolodge. This is manuscript T-9-1081 of the College of Agricultural Sciences and Natural Resource Management, Texas Tech University.

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ELEUTHERODACTYLUS NITIDUS NITIDUS (Shiny Peeping Frog). **BODY TEMPERATURE**. The Mexican endemic, *Eleutherodactylus n. nitidus*, has been little studied. Dixon (1957. Master's Sci. Dissert., Grad. Sch. Agric. Mech. Coll. Texas, pp. 40–59) discussed distribution and geographical variation, and Lynch (1986. Herpetologica 42:248–258) discussed taxonomy. Woolrich-Piña et al. (2005. Anfibios y Reptiles del Valle de Zapotitlán Salinas, Puebla. UNAM-CONABIO, 54 pp. México) provide a more recent overview of natural history. On 13 July 2004, between 2200 and 0100 h we collected 10 *E. n. nitidus* on Cerro Chacatecas, Municipio Zapotitlán Salinas, Puebla, México. Cloacal temperature (T_C) was recorded using a quick-reading thermometer. We also recorded microhabitat temperature (air T_A, and substrate T_S) where the frogs were found. Mean T_C was 16.24 + 0.6°C, mean T_A was 14.02 + 0.2°C, and mean T_S was 14.8 + 0.3°C. A positive and significant correlation was found between T_C and the temperature of the microhabitat ($T_C = -7.79 + 1.71\ T_A$, r = 0.58, P = 0.008, N = 10, for the air; $T_C = -9.24 + 1.72\ T_S$, r = 0.807, P = <0.008, N = 10, for the substrate).

Our results confirm a tendency toward thermoconformity in environmental and organismic temperatures as proposed by Huey and Slatkin (1976. Quart. Rev. Biol. 51[3]:363–384).

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HYLA SQUIRELLA (Squirrel Treefrog). **REFUGIA.** Entomologists commonly use trap-nests to monitor cavity-nesting Hymenoptera. These trap-nests consist of 5 × 10 cm pine timber cut into 12-cm lengths. Five lengths are then stacked and strapped together. Each piece of timber is predrilled in each side to have either a 3.2, 4.8, 6.4, 7.9, or 12.7 mm diameter hole, 8 cm in depth. Thus, each trap-nest consisted of five pieces of wood containing 2 holes of each diameter. They are suspended with wire from tree trunks and branches. We set these wooden traps (N = 10) at Devil's Millhopper Geological State Park, Gainesville, Alachua Co., Florida, USA, from May 2003 to 25 Jan 2005. The habitat is a limestone sinkhole in mixed hardwood forest/pine flatwoods. On 25 Jan 2005, a juvenile *Hyla squirella* (SVL = 18.9 mm) had backed into an abandoned nest of a leafcutting bee, *Megachile xylocopoides* (Hymenoptera: Megachilidae), in a 12.7 mm diameter trap-nest. The abandoned nest which the frog inhabited was incomplete, consisting of 1–2 cells and was constructed from cut leaves lining the 12.7 mm diameter hole. The hylid died after capture; both the frog and the bee nest were deposited in the Herpetology Collection at the Florida Museum of Natural History (UF 143740). We observed other *H. squirella* (ca. 10 times) using trap-nests as refugia, perhaps hibernacula, at the same site during January and February of previous years. We removed all of these frogs from the traps and released them.

Hyla squirella are notorious for their nondiscriminatory habitat selection (Carr 1940. Univ. Florida Publ., Biol. Sci. Ser. 3[1]:1–118; Wright and Wright 1949. Handbook of Frogs and Toads of the United States and Canada. Third Ed. Cornell University Press, Ithaca, New York). Moreover, *H. squirella* typically are collected when they seek refuge in PVC pipe traps suspended from trees (Boughton et al. 2000. Am. Midl. Nat. 144:168–177; Bartareau 2004. Herpetol. Rev. 35:150–152; Muenz and Smith 2005. Herpetol. Rev. 36:75). This is the first instance of which we are aware of *H. squirella* utilizing the nests of megachilid bees as refugia, although we do not know if these hylids utilize naturally constructed megachilid nest cavities in woody vegetation. We recommend further investigation to determine the frequency, seasonality, and significance of this behavioral relationship with cavity nesting hymenoptera in natural situations.

These observations were made during a study of cavity-nesting hymenopterans in north-central Florida conducted by DS. This study was conducted under Permit 08170410 issued by the Florida Department of Environmental Protection.

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LEPTODACTYLUS MARAMBAIAE (Marambaia White-lipped Frog). **DEATH FEIGNING.** Death feigning, or thanatosis, is a defense strategy widespread in anurans (Duellman and Trueb 1986. Biology of Amphibians. McGraw-Hill, Inc. 670 pp.). However, it has been rarely reported for the Neotropical family Leptodactylidae (Hartmann et al. 2003. Herpetol. Rev. 34:50; Toledo et al. 2005.

Herpetol. Bull. 91:29–31). Here we present the first report of death feigning in *Leptodactylus marambaiae*, a small leptodactylid (up to 40 mm SVL; Izecksohn 1976. Rev. Brasil. Biol. 36:527–530) endemic to the Restinga da Marambaia, in Rio de Janeiro State, southeastern Brazil (Frost 2004. Amphibian Species of the World: An Online Reference. Version 3.0, http://research.amnh.org/herpetology/amphibia/index.html). The Restinga da Marambaia is a thin strip of land, 42 km long, situated between Sepetiba Bay and the Atlantic Ocean, connected to the mainland by a narrow isthmus. It is covered predominantly by sandy soils and xerophytic vegetation (i.e. "restinga" habitat). Almost nothing is known about the biology and natural history of *L. marambaiae* (Izecksohn, *op. cit.*).

On 4 Oct 2005, at the western portion (2°04'07.4"S, 43°52'56.1"W) of the Restinga de Marambaia, three of us (CCS, RVM, and DV) found several individuals of *L. marambaiae* on the ground, among the grass, at night. At 2116 h, upon being picked up for observations, one individual (ca. 25 mm SVL) became immobile with limbs held close to the body, in typical death-feigning posture, even after being turned belly up. After being prodded with a finger by one observer, it stretched the front limbs a little, but continued immobile. It remained motionless for about two minutes, and was then released (whereupon it "came back to life" and jumped away). Death-feigning behavior similar to the one observed here have been reported for other anurans (Sazima 1974. J. Herpetol. 8:376–377; Zamprogno et al. 1998. Herpetol. Rev. 29:96–97; Vaz-Silva et al. 2004. Herpetol. Rev. 35:371; Toledo 2004. Herpetol. Rev. 35:371–372). To our knowledge, the only other species of *Leptodactylus* for which death feigning has been reported is *L. labyrinthicus* (Toledo et al., *op. cit.*) in the large-sized *L. pentadactylus* group. This note presents the second record of thanatosis in the genus *Leptodactylus*, and the first for a species in the small-sized *L. fuscus* group.

We thank the Força Aérea Brasileira for logistical support, and especially Captain Walter for allowing access to the area and making many facilities available. During this study CCS received a graduate grant from FAPERJ and RVM received a graduate grant from CNPq. MVS received a research grant from CNPq. Fieldwork was also supported by Conservation International/CEPF and the Instituto Biomas.

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LEPTODACTYLUS NATALENSIS (Bubbling Frog) **PREDATION.** *Leptodactylus natalensis* occurs along the littoral of Brazil, extending from the northeast region to Rio de Janeiro (Heyer 1994. Smithson. Contrib. Zool. 546:1–124). During a study in a temporary pool at the Estação Ecológica do Tapacurá, a remnant of the Atlantic Forest located in the municipality of São Lourenço da Mata, in the state of Pernambuco (09°07'S; 34°60'W), we observed predation of *L. natalensis* eggs by the Scorpion Mud Turtle (*Kinosternon scorpioides*). *Leptodactylus natalensis* digs nest cavities along the edge of pools where the eggs are laid within a white foam and covered by foliage (dead vegetation) or herbaceous roots (Santos and Amorim 2005. Zoociências 7:39–45). On 18 May 2003 the presence of a nest at the east margin of the pool was recorded; it rained heavily in the region during the night and early morning of the next day and the area surrounding the nest was flooded. This caused the foliage-covered nest to float on the surface of the water (depth ca. 30 cm after the rain). During the afternoon of 19 May 2003, between 1439 and 1456 h (air temperature 26°C), a *K. scorpioides* was observed in the water feeding on the eggs dispersed among the foam for a period of 7 minutes. This is the first recorded instance of *L. natalensis* egg predation by *K. scorpioides*.

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LITORIA JUNGGUY (Stoney Creek Frog)**. PREDATION.** Reports of frog predation are biased towards those on tadpoles and juvenile frogs, and there are few reports on the predation of adult frogs, particularly of larger species. Here I report the apparent predation of a large adult *Litoria jungguy*, by a Long-finned Eel (*Anguilla reinhardtii*), during the course of a radio tracking study at a stream near Babinda, tropical north Queensland, Australia (145°55'S, 17°18'E, 20 m elev.). *Litoria jungguy* is a relatively large, terrestrial hylid frog, common in tropical north Queensland. During a radio tracking study, a female *L. jungguy* (SVL = 65.3 mm, mass = 26.8 g) was captured during the night of 17 March 2005 and fitted with a small (0.68 g) radio-transmitter attached to the frog externally with a silicon tubing waist-belt. During the study, frogs were located both diurnally and nocturnally for ca. two weeks. The last sighting of the frog was at 1930 h on 22 March 2005, when it was observed on terrestrial vegetation ca. 3 m from a stream. The following night at 2030 h, the transmitter signal was strongest under the submerged root mass of a tree in the same stream. For the next five days, I tracked the signal up and downstream along the river, which typically moved ca. 10 m between observations. The signal always originated from underwater and I was never able to observe any animal due to the signal coming from undercut banks, root masses, and dense terrestrial vegetation. On the 28 March 2005 at 1200 h I recovered the transmitter, still attached to the tied waistband. As it would have been impossible for the waistband to remain tied and fall off the frog, due to the small waist-size and robust thighs of the frog, the frog must have been eaten by a large, aquatic predator. *Anguilla reinhardtii* was the only such predator present in the study stream, was commonly encountered, and published behavior and habitat preferences for the species match those observed in my study (Pusey et al. 2004. Freshwater Fishes of North-eastern Australia. CSIRO Publishing, Collingwood). I therefore conclude that the *L. jungguy* was predated upon by an *A. reinhardtii*.

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MANTIDACTYLUS LIBER (NCN) and ***M. DEPRESSICEPS*** (NCN). **CROSS-SPECIES MATING.** Among the Malagasy herpetofauna, mantellines are one of the major clades of frogs, and are characterized by several features related to reproduction and mating behavior (Blommers-Schlösser 1979. Beaufortia 29:1–77). To date all known *Mantidactylus* and *Mantella* males lack strong mating amplexus, nuptial pads, and release calls (Glaw and Vences 1994. A Field Guide to the Amphibians and Reptiles of Madagascar. 2nd edition. Vences and Glaw, Köln. 480 pp.). The femoral glands of these frogs have been suggested as a possible organ to stimulate the female during the fertilization of the eggs (Glaw and Vences 1994, *op. cit*), or to aid in attachment to female during reproduction (Brizzi et al. 2003. *In* B. G. M. Jamieson [ed.], Reproductive Biology and Phylogeny of Anura. Science Publ., New Hampsire. 452 pp.), but these hypotheses have not been tested.

Reproductive behavior has been best studied in species such as *Mantidactylus liber* and *M. depressiceps* (Blommers-Schlösser 1975. Beaufortia 23:15–25) that belong to the subgenus *Guibemantis* in the genus *Mantidactylus*. They deposit eggs on leaves overhanging stagnant waters where tadpoles later complete their development. Females and males, which are of similar body size, sit on vertical leaves, the males at higher positions, with their posterior body and hind limbs covering the female's head and anterior dorsum. The sperm of male probably slides down the back of the female reaching the eggs laid by the female (Blommers-Schlösser 1975, *op. cit.*; 1979, *op. cit.*). There have been no records of mixed mating or hybridization among these species.

FIG. 1. Male *Mantidactylus liber* (small specimen, top) mating with a female *M. depressiceps* (bottom) that already has deposited its (white) eggs. Photographed at Ranomafana National Park, 21 Jan 2004.

On 21 Jan. 2004, before sunset (ca. 1700 h), we observed a large breeding aggregation of *M. depressiceps*, *M. liber*, and *M. tornieri* in a roadside ditch along the road between Vohiparara and Ranomafana (21°15.387' S, 47°24.602' E, 1013 m elev., Ranomafana National Park). Explosively timed intense breeding was observed during three consecutive days whereas subsequently only single individuals were found. During several instances we observed male-male combat in *M. depressiceps*, and an instance in which a sneaking male interrupted a mating pair.

In one case a male *M. liber* attempted to mate with a female *M. depressiceps* that had just deposited her clutch of typical white eggs (Fig. 1). Females of these species are known to guard eggs for minutes or hours after their deposition. *Mantidactylus liber* is a distinctly smaller species than *M. depressiceps*, yet the male performed rhythmical reproductive movements with its hind limbs over the female's head as typical (Blommers-Schlösser 1975, *op. cit.*). This behavior was continuous for at least 10 min before the individuals separated, probably disturbed by the heavy rain and our photography. These observations demonstrate that cross-species mating is possible in sympatric explosive breeding *Mantidactylus*, despite their different advertisement calls and body size, and lack of amplexus behavior.

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PHYLLOMEDUSA BURMEISTERI (Leaf Frog). **BEHAVIOR.** In many anurans, territorial behavior is common during male-male interactions (Martins et al. 1998. Amphibia-Reptilia 9:46–90). It is accomplished through behavioral patterns ranging from calls (advertisement, territorial, and/or encounter calls) to physical combat (Halliday and Tajedo 1995. *In* Heatwole and Sullivan [eds.], Amphibian Biology, Volume 2: Social Behaviour, pp. 419–468. Surrey Beatty & Sons). The data available for aggressive behavior in *Phyllomedusa* show that breeding aggregations of this species are characterized by low number of individuals, site fidelity, complex vocal repertoire, visual communication, and male-male combat, suggesting that calling males exhibit territorial behavior (Abrunhosa and Wogel 2004. Amphibia-Reptilia 25:125–135).

Herein, we report attempted dislodgment of an amplectant male *P. burmeisteri* by two solitary males. The observation were made in gallery forest vegetation over a stream near the Mucuri River (17°44'S, 41°43'W), municipality of Poté, State of Minas Gerais,

FIG. 1. Aggressive behavior (i.e., fighting) in *Phyllomedusa burmeisteri*, depicting three males in direct contact with the female, while a fourth male waits nearby.

Brazil, on 1 Dec 2004. The observation started when the pair was already in amplexus, ca. 2.5 m above ground, and three solitary males were perched on nearby bushes, emitting advertisement calls. The dislodgment attempt started when one of the solitary males approached the pair, trying to grasp the female from the ventral surface. During this confrontation, the amplectant male physically contacted the intruder male, stretching and retracting his legs (alternating the legs), trying to remove the intruder from the female and himself. This behavior of the amplectant male was similar to that reported by Abrunhosa and Wogel (2004, *op. cit.*) during acoustic interactions between calling males. The intruder, in turn, seized the head of the amplectant male while still holding the female's ventral surface. At this moment, the female was suspended from a leaf by her feet, still being held by the two males. The second solitary male joined the group, but stayed in a position opposite of the female and the other two males, with his head directed toward top. The female remained suspended from the leaf with her feet, while the three males grasped her, emitting encounter calls and using their nuptial excrescences to attack the opponents. A third solitary male was perched nearby and was not directly involved in the dislodgment attempt (Fig. 1). After ca. 40 min the female fell on the vegetation and only the first male remained in amplexus. The latter phases of courtship (oviposition) were not observed.

We thank P. Abrunhosa and J. P. Pombal Jr. for commenting on the manuscript, P. Barrancos for the local facilities, and ProBio/MMA, Conservation International, and CNPq for providing financial support.

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PHYLLOMEDUSA TRINITATIS (Trinidad Leaf Frog). **HABITAT USE**. *Phyllomedusa trinitatis* is generally considered to be a widespread, lowland species that occurs in secondary forests and along forest edges (Murphy 1997. Amphibians and Reptiles of Trinidad and Tobago. Krieger Publishing Co., Malabar, Florida. 245 pp.). In Trinidad, this frog has rarely been observed at elevations exceeding 100 m (Kenny 1969. Studies of the Fauna of Curacao and Other Caribbean Islands 29(108):1–78). Here, we report an observation of *P. trinitatis* in montane rainforest during the wet season.

On 24 July 2005 at 1745 h EST, we captured an adult female *P. trinitatis* at our camp on Morne Bleu Ridge in the Northern Range of Trinidad (10°43'53"N, 61°15'08"W; WGS 84; elev. 823 m). Local vegetation at this site is typical for montane rainforest and features several species of palms, bromeliads, lianas, and small trees with a closed canopy between 15–18 m. The frog (80 mm SVL) was caught shortly before dusk, observed briefly, photographed, and released. At the time of the observation, there was virtually no precipitation. However, for the preceding 24 h (especially from 1800 h on 23 July to 1500 h of 24 July), our camp had been inundated with a steady and, at times, heavy rainfall (ca. 2 cm/h).

Murphy (1997, *op. cit.*) noted the occurrence of seven anuran species in the montane rainforests in Trinidad, including two bromeliad-breeding specialists (*Flectonotus fitzgeraldi* and *Phyllodytes auratus*, an endemic) and five widespread, habitat generalists (*Bufo marinus*, *Mannophryne trinitatis*, *Phrynohyas venulosa*, *Eleutherodactylus urichi*, and *Leptodactylus validus*). Our observation increases this total and indicates that *P. trinitatus* might more extensively use montane rainforests than previously believed.

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RANA CATESBEIANA (American Bullfrog). **DIET**. Bullfrogs are opportunists capable of capturing a wide variety of prey, including flying insects, bats, and birds (Bury and Whelan 1984. US Fish Wildl. Serv. Publ. 155. USDI, Washington, DC). Here I present evidence of an additional bird species caught as prey: Anna's Hummingbird (*Colypte anna*).

On 20 Aug 2003, at Valentine Pond in Joseph Grant County Park in Santa Clara Co., California, USA (37°19'14.043"N, 121°40'22.226"W), I captured an adult female *R. catesbeiana* (178 mm SUL, 595 g, gape 64 mm). After a photograph was taken, the frog was killed and stored in a cooler until the end of the workday.

That evening I weighed and measured the frog, removed the entire digestive tract, and froze it for later processing. Months later, I thawed the sample and opened the stomach to discover it contained a darkling beetle (*Eleodes dentipes*), a Pacific Treefrog (*Hyla regilla*), and the feathers and partially digested bones of a hummingbird. The tail feathers were intact, but bones of the posterior skeleton disintegrated at the slightest touch. I opened the rest of the digestive tract and discovered the remaining feathers and the ramphotheca of an Anna's Hummingbird. The presence of the reddish gorgette feathers confirmed the hummingbird bird was a male, and that the bird had been swallowed headfirst.

I thank D. Clark of the Santa Clara County Parks Department for his facilitation and help with the survey.

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RANA CATESBEIANA (American Bullfrog). **MORTALITY**. *Rana catesbeiana* is an ambush predator with a highly varied diet (Bury and Whelan 1984. U.S. Fish Wildl. Serv. Res. Publ. [155]:1–23). Snakes, including garter snakes (*Thamnophis* spp.; McKamie and Heidt 1974. Southwest. Nat. 19:107–111; Bury and Whelan, *op. cit.*), are occasionally taken, but the Northwestern Garter Snake (*Thamnophis ordinoides*) has not been reported as prey, despite the fact that the introduced range of *R. catesbeiana* broadly overlaps that of *T. ordinoides* in the Pacific Northwest (Nussbaum et al. 1983. Amphibians and Reptiles of the Pacific Northwest. Univ. Press of Idaho, Moscow. 332 pp.; Leonard et al. 1993. Amphibians of Washington and Oregon. Seattle Audubon Society, Seattle. 168 pp.; Dvornich et al. 1999. Washington State Gap Analysis. http://wdfw.wa.gov/wlm/gap/dataprod.htm). Moreover, reports of mortality resulting from consumption of prey are rare for ranid frogs, despite their generally voracious feeding habits. Hence, we here provide an unusual observation of *R. catesbeiana* predation on *T. ordinoides*, an event that apparently resulted in the death of the former.

At 1700 h on 10 April 2005, we encountered a dead adult (121 mm SVL) female *R. catesbeiana* on the muddy bank of a farm pond in Marion County, Oregon (45°13'56"N, 122°47'22"E, WGS 84; elev. 55 m). We found the frog 1.5 m up the bank, its limbs outstretched in a crawling position. Closer examination revealed that the frog had the tail of a snake protruding from its cloaca. The frog had lost at least 25% of its body volume to desiccation. Its ventral surface, particularly the undersides of its legs and feet, was reddish in color, as opposed to the white or cream color of a healthy American Bullfrog.

Dissection of the frog revealed the protruding tail was *T. ordinoides* (> 400 mm SVL) of unknown sex (combined mass of frog and snake = 127 g). The anterior portion of the snake, in the frog's esophagus, was partly digested. In particular, the skin and muscle tissue on the snake's head (located in the lower esophagus) was digested enough to reveal the bones of the skull. Curiously, the portion of the snake in the frog's stomach (a ca. 100 mm long segment) appeared undigested, with skin and scales still intact. Progressing posteriorly, the segment of the snake passing through the frog's intestine (a piece > 100 mm long) was increasingly digested. The last 106 mm of the snake protruded from the frog's cloaca. Of this last part, the 10 mm closest to the frog's body had been reduced to spine; the remaining 96 mm of tail were completely intact, with no noticeable digestion of the skin, scales, or muscle tissue.

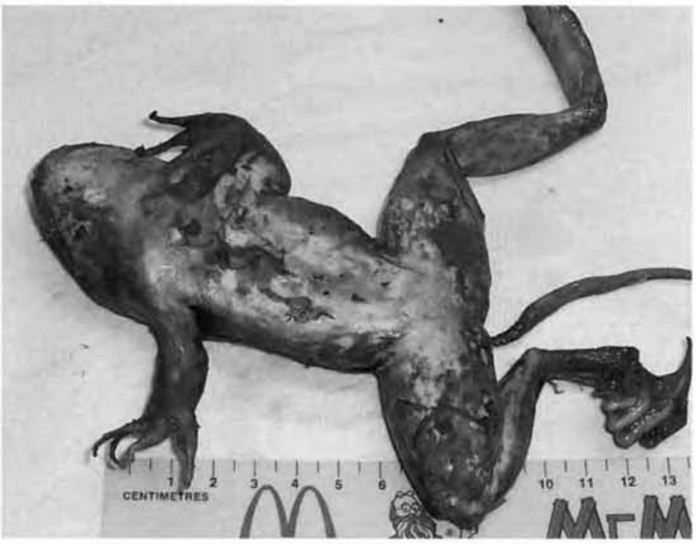

FIG. 1. Dead *Rana catesbeiana* (121 mm SVL) with tail of *Thamnophis ordinoides* protruding from vent.

The frog's internal organs were found in varying states of necrosis. In best shape were the lungs, heart, and upper digestive tract (esophagus and stomach); the lungs appeared least decomposed of all and were still red. The lower portions of the intestine were the most decomposed; in particular, a section of the large intestine between 1.5 and 5.5 cm anterior to the frog's cloaca was black and entirely necrotic. The snake's scales had perforated this section of intestine, presumably as the snake passed through tail-first. The intestine at this point was impacted, and several centimeters of the intestine were "bunched up" around the tail of the snake. The advanced decomposition of the length of snake extending from this point to the cloaca suggested that this portion of the snake had been fixed in place for a relatively long time.

We hypothesize that the events leading to the frog's death were as follows: The frog ate the snake, swallowing it tail first. As the diameter of the snake's body passing through the frog's intestine increased, the backward-pointing, keeled scales caught on the frog's intestinal wall, causing impaction and subsequent perforation of the intestine. As a result of this perforation, bacteria from the fecal material and putrefying snake initiated a localized infection that quickly became systemic, killing the frog.

Two points of this observation are noteworthy. First, the identity of the prey reveals that the introduced *R. catesbeiana* preys on *T. ordinoides*, an observation for which this represents the first published record. Second, this observation illustrates a risk associated with eating rough-bodied prey (e.g., snakes with keeled scales), even if the defensive capabilities of the prey species are ineffective in preventing their consumption.

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RANA DRAYTONII (California Red-legged Frog). **PREY.** Few dietary data exist for *Rana draytonii*, a taxon only recently recognized as a full species (Shaffer et al. 2004. Mol. Ecol. 13:2667–2677). Available data are those of Hayes and Tennant (1985. Southwest. Nat. 30:601–605), who reported on the gastrointestinal tract contents of 35 post-metamorphic frogs collected in Los Angeles, San Bernardino, and Santa Barbara counties, California, USA. Moreover, its federal status as a threatened species since 1996 (US Fish and Wildlife Service 1996. Fed. Regist. 61:25813–25833) has limited the ease of gathering additional dietary data. Hayes and Tennant (*op. cit.*) reported a single adult *Peromyscus californicus* in two female *R. draytonii* (117 and 128 mm SVL; MPH, unpubl. data). To these data, we add two additional observations.

Henry Carsten Kellers collected a 126 mm SVL adult female *R. draytonii* (United States National Museum of Natural History [USNM] 52899) at Calistoga (38°34'N, 122°34'W WGS 84; elev. 110 m), Napa Co., California. The collection date is unknown, but the accession date is 27 Sept 1915. The location is imprecise, but springs and marshes were extensive in the vicinity of Calistoga at the time of collection (Archuleta 1977. The Brannan Saga, Early Day Calistoga. Smith-McKay Printing, San Jose, California. 116 pp.). The stomach of this frog contained a *Microtus californicus*, which was nearly adult-sized based on the 20.1 mm length of its left hind foot (Jameson and Peeters 2004. California Mammals. Revised ed. Univ. California Press, Berkeley. 440 pp.).

On 2 May 1996, GBR collected a dead and desiccated adult female *R. draytonii* (USNM 539491) in altered coastal scrub habitat in a fenced compound with several sewage percolation ponds (see Rathbun et al. 1997. Herpetol. Rev. 28:85 for details) operated by the Cambria Community Services District, ca. 6 km NW of Cambria (35°35'48"N, 121°07'08"W, WGS 84; elev. 5 m), San Luis Obispo Co., California. This frog, whose size and mass were recorded as 119 mm SVL and 167 g on 18 March 1996 (Rathbun et al., *op. cit.*), had an adult *Reithrodontomys megalotis* (USNM 568171) in its stomach.

Two aspects of these observations merit comment. *Rana draytonii* makes significant seasonal forays into terrestrial habitat (Rathbun et al., *op. cit.*; Bulger et al. 2003. Biol. Conserv. 110:85–95), so opportunities for largely nocturnally foraging adults to encounter small mammal prey may be frequent. Both of these small mammal species often occur at high densities in mesic terrestrial habitats near aquatic habitats in coastal California (Blaustein 1980. Behav. Ecol. Sociobiol. 6:247–255). Second, as with the previously published observations of small mammal prey (Hayes and Tennant, *op. cit.*), these observations involve adult female frogs. Females average ca. 20 mm SVL larger than males (Hayes and Miyamoto 1984. Copeia 1984:1018–1022), so females may consistently take larger prey than males.

Steve Gotte, Roy McDiarmid, and Robert Fisher (USGS Patuxent Wildlife Research Center), and Jeremy Jacobs (Smithsonian Institution) assisted in the examination the *R. draytonii* specimens, identification of the mammal prey, and provision of measurements. GBR's 1996 work was conducted under federal subpermit NBSPBS-1.

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RANA SYLVATICA (Wood Frog). **TERRESTRIAL AMPLEXING PAIRS**. On the evening of the 17 April 2005, at ca. 2100 h, three amplexing pairs of *Rana sylvatica* were found on Crowe's Line Road near Bobcaygeon, Ontario, Canada (44°33'N, 78°33'W). The pairs were likely heading toward a large chorus of 200–300 male *R. sylvatica* (as well as two other chorusing species) in the wetland on the other side of the road (the direction in which the female of each pair was oriented). Upon further investigation of the wetland, ca. 25–30 freshly deposited *R. sylvatica* egg masses were found. The air temperature was 10–12°C, and the water temperature in the wetland was 12°C. The sky was clear and three quarters of the moon was visible; the humidity was low; the road was not moist nor were the ditches particularly wet.

The discovery of terrestrial amplexing pairs suggests that male *R. sylvatica* might have an alternate mating strategy to attending and participating in a chorus, that is, intercepting and amplexing a female on land and then being piggy-backed by the female to a suitable oviposition site.

These specimens are currently reposed at Trent University, Peterborough, Ontario and are part of an ongoing study of emerging wildlife diseases in Ontario. We thank Michael Berrill and Jean Duffus for comments on earlier versions of this note.

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RANA SYLVATICA (Wood Frog). **TADPOLE MAXIMUM SIZE.** On 24 July 2004, eight *Rana sylvatica* tadpoles were collected at Pointe-des-Monts, Québec, Canada (49°19'8"N, 67°24'30"W), on the north shore of the St.-Lawrence River. These tadpoles, up to 66 mm TL, are the largest reported for the species. Maximum TL reported in the literature is 48 mm (Conant and Collins 1998. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts. 616 pp.), 49 mm (Wright and Wright 1949. Handbook of Frogs and Toads of the United States and Canada. Comstock Publ. Assoc., Ithaca, New York. 640 pp.), and 50 mm (Orton 1952. Amer. Midl. Nat. 47:382–395). Our tadpoles are up to 16 mm longer TL. About 15 tadpoles were seen in this pool; eight were collected and deposited at the Canadian Museum of Nature (CMNAR 35819). Total lengths are 66.3, 65.8, 65.7, 65.0, 63.7, 62.3, 61.4, and 56.22 mm, the last having a broken caudal fin. Body lengths (tip of snout to base of hind limbs) range from 20.8 to 22.3 mm. All have hind limbs and are at Gosner Stages

38–39 (Gosner 1960. Herpetologica 16:183–190).

Tooth row formula for most of these tadpoles is 3/4 (3 upper rows and 4 lower). Two tadpoles have 3/3 tooth rows, but one seems to have partially broken mouthparts.

These tadpoles were in a 6 × 7 m pool in bedrock, 30 cm deep, located 60 m from the St.-Lawrence River. It was bordered with Black Crowberry (*Empetrum nigrum*) and Leatherleaf (*Chamaedaphne calyculata*). The water was salty, with a marine fauna: Blue Mussel (*Mytilus edulis*), Steamer Clam (*Mya arenaria*), Periwinkle (*Littorina* sp.), Sandworm (*Nereis virens*), and barnacle (*Balanus* sp.). Coniferous forest was about 100 m N of the pool.

The major interest in this discovery is to understand why these northern shore line Wood Frog tadpoles are so big: has their growth been enhanced or their metamorphosis inhibited? It seems likely that the pool would have frozen solid during the winter, so they might have grown to this exceptional size in the two months since the breeding season.

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RANA SYLVATICA (Wood Frog). **CHYTRIDIOMYCOSIS.** The chytrid fungus, *Batrachochytrium dendrobatidis* (BD), has been implicated in mass amphibian mortalities and global population declines (Berger et al. 1998. Proc. Natl. Acad. Sci. 95:9031–9036; Pounds et al. 2006. Nature 439:161–167). On 25 July 2002, a dead subadult male *Rana sylvatica* (26 mm SVL; 1.8 g body weight after ethanol fixation) was collected near a pond on the Kenai National Wildlife Refuge, Alaska, USA (60.62741°N, 150.81557°W, WGS 84). The frog was preserved in ethanol and shipped to the U.S. Geological Survey, National Wildlife Health Center (NWHC) in Madison, Wisconsin, USA. A whole-body radiograph of the specimen showed a normal musculoskeletal system with a paucity of calcium carbonate in the paravertebral endolymphatic sacs. Histological sections of two hindlimb digits and ventral skin (pelvic patch area) showed mild hyperkeratosis of the epidermis with numerous 6–12 µ diameter empty chytrid thalli within keratinized cells of the *stratum corneum*. These epidermal lesions were diagnosed as mycotic hyperkeratotic epidermitis due to infection by BD. On 18 July 2002, five dead tadpoles were observed at this site but not submitted for disease diagnosis. Calling adult Wood Frogs, egg masses, or tadpoles were detected in 18 of 26 site visits during 2000–2005, and live frogs were documented at the site each year. This site borders a gravel road. There are no reptiles or fish at this site. No other species of amphibian has been detected on the Kenai Refuge during surveys of >100 ponds during 2000–2005. Waders and nets are disinfected with 5% bleach solution between sites. This is the first report of a BD-infected frog from Alaska. The effects of BD at such a high northern latitude, and on this population, are unknown. The specimen is stored in ethanol at the National Wildlife Health Center (Case #4848-041).

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RANA YAVAPAIENSIS (Lowland Leopard Frog). **EGG AND TADPOLE PREDATION.** Ranid frogs in the western United States have been disproportionally affected by amphibian declines (Bradford 2005. *In* M. Lannoo [ed.], Amphibian Declines: The Conservation Status of United States Species, pp. 916–925. Univ. California Press, Berkeley). Among the many causative agents for these declines, predation by non-native fishes has been strongly implicated, especially in naturally fish depauperate areas (Bradford 2005, *op. cit.*). However, first-hand descriptions of egg predation by introduced fish have rarely been reported. Here, I describe predation on a *Rana yavapaiensis* egg mass by non-native catfish in southern Arizona.

On 20 August 2002, I watched two *Ameiurus melas* (Black Bullhead; Deborah Sebesta, USFS District Biologist, Coronado National Forest, pers. comm.), each ca. 25–35 cm long, prey upon a *R. yavapaiensis* egg mass. The egg mass was located within 5–10 cm of the water's surface, ca. 2.5 m from the creek shore, in water 1.0–1.5 m deep, in a slow moving oxbow of Peck Canyon in southern Arizona (31°29'N, 111°04'W). The substrate was coarse sand and gravel. The eggs were just hatching, Gosner Stages 20–25 (Gosner 1960. Herpetologica 16:183–190), and the hatchling tadpoles were still in a tight aggregation around or within the egg mass. The fish repeatedly swam through the egg mass with mouths open, turning around for another run after passing beyond the eggs by 10–30 cm. The possibility exists that the eggs were of *R. chiricahuensis*, also recorded from the general area. However, on this day hundreds of *R. yavapaiensis* metamorphs were observed, with no *R. chiricahuensis* documented from this length of the canyon (unpubl. data).

I thank Kevin Bonine and Cecil Schwalbe for reviewing an earlier version of this note.

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RHACOPHORUS KAJAU (White-eared Tree Frog). **FOOT FLAGGING.** A population of *Rhacophorus kajau* occurs at Kubah National Park (01°33'N, 110°12'E), Matang, Sarawak, Malaysia (Borneo). While being photographed *ex-situ* indoors on 11 Dec 2005 and 22 Jan 2006, two adult males exhibited a behavior previously unreported in this species. While keeping the forelimbs planted on the substratum (in both cases, green leaves), the hind limbs were extended upward, and turned counter-clockwise at the level of the knee, with the undersurfaces of the shanks and sole touching the posterior of the dorsum of the body (Fig. 1). The entire action was performed in under 1 sec. Males of *R. kajau* are typically found in social groups of up to five in the wild. We suggest that the behavior, exhibited under stress such as handling associated with photography or the bright light from a flash, simulates the behavior, and is a warning to conspecifics, when the pale undersurfaces of limbs, black webbing, and/or the typically con-

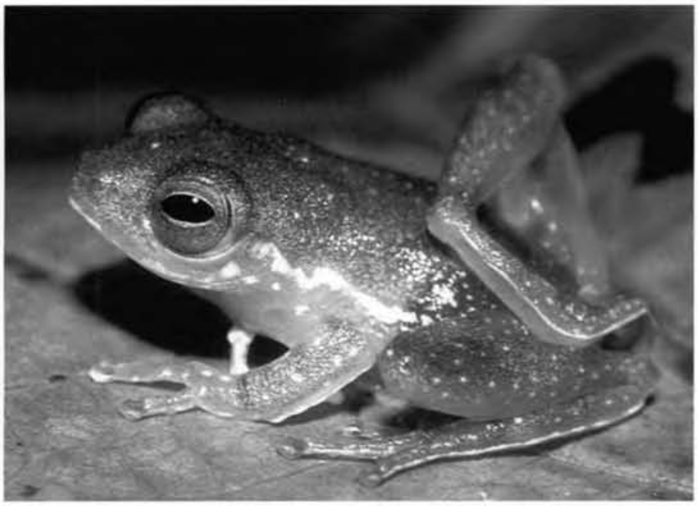

FIG. 1. Foot-flagging in *Rhacophorus kajau*, showing a hind limb turned counter-clockwise at the level of the knee.

cealed orange-colored trailing edges of the thighs are briefly exposed. Other examples of foot flagging reported in anuran amphibians (e.g., Hödl and Amézquita 2001. *In* M. J. Ryan [ed.], Anuran Communication, pp. 121–141. Smithsonian Institution Press, Washington, D.C. and London; Malhotra and Davis 1991. J. Bombay Nat. Hist. Soc. 88:157–166; Davison 1984. Sarawak Mus. J. 33:177–178) are associated with reproduction.

We thank the Sarawak Forestry Corporation for permission to work in areas under its jurisdiction; the Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak, and Biozentrum Grindel und Zoologisches Museum, Universität Hamburg for support; and Volkswagen Stiftung for a research grant (No. 1/79 405).

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SCINAX ALCATRAZ (Alcatraz Snouted Treefrog). **PREDATION.** *Scinax alcatraz* is endemic to Ilha dos Alcatrazes and listed as critically threatened by IUCN (2004. Guidelines for protected area management categories). The natural history of this species has not been studied in detail. Here we describe the first report of *S. alcatraz* predation by a spider. The observations were made at Ilha dos Alcatrazes, an island of 135 ha located 35 km off the coast of São Paulo State, Brazil (24°06'S, 45°42'W). On 22 Nov 2005 at 2230 h, we observed an immature Wandering Spider (*Oligoctenus medius*; Ctenidae) preying on an adult male *S. alcatraz* (23.8 mm SVL) on a bromeliad leaf. At the moment of the observation, the spider was biting the middle section of the treefrog's thigh (Fig.1). The frog was alive but motionless with legs extended. We captured the prey and predator separately. In a few hours, the treefrog was dead. Our observation corroborates

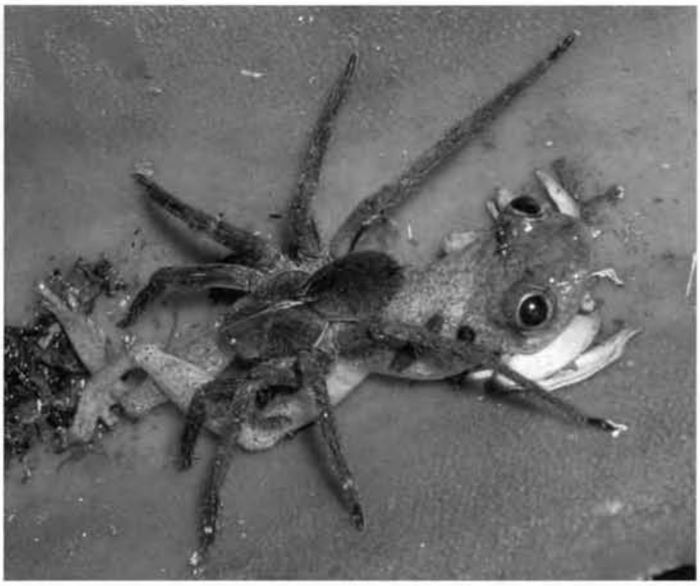

FIG. 1. Adult male *Scinax alcatraz* being captured and envenomated by an immature Wandering Spider on Ilha dos Alcatrazes, Brazil.

studies suggesting that spiders may be important predators of frogs (Hayes 1983. Biotropica 15[1]:74–76). The specimen of *S. alcatraz* is deposited at Coleção de Anfíbios, Departamento de Zoologia, UNESP – Campus Rio Claro, Brazil (accession number CFBH 10463). The specimen of *O. medius* is deposited at Coleção de Aranhas, Instituto Butantan, São Paulo, Brazil (accession number IBSP 59750).

We are grateful to K.R. Zamudio for comments on this manuscript. We thank Estação Ecológica de Tupinambás, Instituto de Biologia da Conservação, Fapesp, Biodiversitas/CEPAN, Fundação O Boticário and Idea Wild for logistical and financial support; Dr. Rogerio Bertani identified the spider. CAB was funded by Fapesp and HMO by CNPq during this project. Specimens were collected under permit number 184/2004 issued by IBAMA.

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THOROPA MILIARIS (Rock River Frog). **TADPOLE PREDATION**. Anurans are preyed upon by several types of invertebrates (Hinshaw and Sullivan 1990. J. Herpetol. 24:196–197; Marra et al. 2003. Herpetol. Rev. 34:55–56; Peltzer and Lajmanovich 2003. Herpetol. Rev. 34:231; Tsuji 2005. Herpetol. Rev. 36:125–127). Information is available on insects as predators of both adult (Haddad and Bastos 1997. Amphibia-Reptilia 18:295–298; Brasileiro et al. 2003. Herpetol. Rev. 34:137; Toledo 2003. Phyllomedusa 2:105–108) and tadpole (Azevedo-Ramos et al. 1992. J. Herpetol. 26:335–338; Hero et al. 1998. Austr. J. Ecol. 23:474–482; Azevedo-Ramos and Magnusson 1999. Copeia 1999:58–67; Eterovick and Sazima 2000. Amphibia-Reptilia 21:439–461) anurans in Brazil. The nocturnal frog *Thoropa miliaris* is a leptodactylid endemic to the Brazilian Atlantic Rainforest

Biome that lives on and among wet rocks in all stages of its life cycle (Bokermann 1965. An. Acad. Bras. Ci. 37:525–537). Here, we report an incidence of predation on a *T. miliaris* tadpole by an insect larva.

At 2328 h on 24 Sept 2005 at the Mãe D'Água dam (23°10'92.3"S, 44°12'04.4"W) in Ilha Grande, an island located in the southern coast of Rio de Janeiro State, municipality of Angra dos Reis, southeastern Brazil, two of us (CCS and CVA) observed a larval *Tropisternus* sp. (Coleoptera, Hydrophilidae, total length 10.8 mm) attacking a tadpole *T. miliaris* (body length 8.0 mm, total length 25.0 mm) in a small stream in the forest. Larval *Tropisternus* cannot be identified to specific level. The larva was moving along the water film on a rock when it captured the tadpole, grabbing it by the tail base, and entered the tadpole's body through the vent tube. The insect took about two minutes to kill the tadpole and then started eating it from the inside, which it did for around 12 minutes. Then it broke part of the tadpole's tail and started squeezing it and consuming the flesh at the broken end of the tail, for about nine minutes. It then stopped eating, but after seven minutes it restarted. At 0014 h it stopped again. The observation lasted about one hour. During this period, another larval *Tropisternus* sp. attempted to capture two other tadpoles but was unsuccessful. The larva was collected and deposited at the Coleção Entomológica do Departamento de Zoologia da Universidade Federal do Rio de Janeiro (DZRJ-1975).

Previously reported predators of eggs and tadpoles of *Thoropa miliaris* are conspecific tadpoles (Giaretta and Facure 2004. Biota Neotropica 4:1–10) and adult *Cyclorhamphus boraceiensis* (Hartmann et al. 2003. Herpetol. Rev. 34:50). Dipteran larvae (maggots) have been reported as predators of eggs of *Thoropa lutzi* (Bokermann, *op. cit.*). This is the first report of predation by an insect on *T. miliaris* tadpoles.

We thank Davor Vrcibradic for helpful suggestions on the manuscript, and Janira Martins Costa and Nelson Ferreira Junior for identifying the insect larva. We thank the Centro de Estudos Ambientais e Desenvolvimento Sustentável (CEADS/UERJ) for local support and for making many facilities available. During this study CCS received a graduate fellowship from FAPERJ, and CFDR (Processes No. 307 653/2003-0 and 477981/2003-8) and MVS (Process No.301401/04-7) received Research Grants of the Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq.

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XENOPUS LAEVIS (African Clawed Frog). **SURFACE PREY CAPTURE**. The aquatic *Xenopus laevis* is regarded as predominantly feeding on aquatic invertebrates (Inger and Marx 1961. Explor. Parc. Natn. Upemba 64:1–85; Kazadi et al. 1986. Ann. Soc. R. Zool. Belg. 116:227–234; Schoonbee et al. 1992. Wat. S. Afr. 18:227–236). However, some field studies also report a large number of terrestrial invertebrates in the stomach contents of *Xenopus*. Tinsley et al. (1996. *In* Tinsley and Kobel [eds.], The Biology of *Xenopus*, pp. 35–59) suggested that *Xenopus* might capture prey from the water surface, but "this possibility has been inadequate to explain the very high proportion of terrestrial prey in the diet ...". Here we present some field observations of surface prey capture of *X. laevis*.

Observations were made during field studies on *Xenopus* in three periods: 1–13 Jan 1994, 9 Jan – 4 Feb 1995, and 3 Jan – 19 Feb 1996. The study site was the "Torchwood Pond" (24°25'S, 30°50'W) near Hoedspruit, NE Transvaal, South Africa. This seasonal pond was 65 m^2 in size, located at the wooded slope of the Drakensberg Mountains at an altitude of 750 m, and contained a native population of about 80–100 *Xenopus*, most of them marked.

On 4 Jan 1994 at 0030 h, flying termites passed the pond and hundreds of them dropped into the water. We observed numerous *Xenopus*, body floating in typical posture of 45° under water and eyes above the water or swimming, locating, and catching the wriggling insects. One male (62 mm SVL) caught eight termites within about 20 min.

Two cases of surface prey capture during light rainfall were recorded at 2030 h on 16 Jan 1995. Probably due to the rain, several small moths (ca. 10–15 mm length) were trapped on the water surface. Some *Xenopus* were floating and swimming at the surface. Within about 10 min, we observed two *Xenopus* collecting one moth each. Size and sex of both *Xenopus* could not be recognized due to the choppy water surface.

At 2230 h on 6 Feb 1996, while observing an adult female *Xenopus* (73 mm SVL), a moving cricket (ca. 30 mm length) was spotted on the water's surface. The female was floating at the surface and started swimming toward the cricket a distance of about 20 cm, caught the cricket, and swallowed it under water.

At 2000 h on 18 Feb 1996, a preying mantis (ca. 70 mm length) dropped from an overhanging branch. A female *Xenopus* (75 mm SVL) sitting in shallow water, started swimming over a distance of about 40 cm and caught the mantis. It took about 10 min for the female to swallow the big insect.

Similar observations were made in several nights in all three study periods, indicating that surface prey capture might be a regular event. The only aquatic invertebrates observed in the pond were a few water bugs (Heteroptera) and hand sized crabs (*Potamon* sp.), suggesting that potential aquatic prey might be limited. Surface prey capture as reported herein may explain, for e.g. confined ponds or lack of aquatic prey, high frequencies of terrestrial invertebrates in the stomach contents of *Xenopus*. It might also explain the ability for excellent analyses of water-surface waves with the lateral-line organs of *Xenopus* (Elepfandt 1996. *In* Tinsley and Kobel [eds.], pp. 98–120, *op. cit.*).

We are indebted to Prof. Duncan Mitchell (Johannisburg) and H. Stander (Hoedspruit) for enabling access to the "Torchwood Pond."

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TESTUDINES

CHELODINA OBLONGA (Narrow-breasted Snake-necked Turtle). **PLANKTON FEEDING BEHAVIOR.** The turtle genera *Chelodina*, *Macrochelodina*, *Chelus*, *Hydromedusa* (Chelidae), and *Chitra* and *Pelochelys* (Trionychidae) display a high degree of specialization for catching fast-moving prey like fish and shrimps. All those genera have long necks, elongated and flat heads with rather weak jaws, and forward-positioned eyes that provide good binocular vision. Their feeding behavior involves accurate, fast strikes at prey items and a gape and suck mechanism: an explosive expansion of the throat generates an inrush of water that carries the prey with it. The mouth is then closed to a crack, the water expelled, and the prey swallowed (Legler 1978. Can. J. Zool. 56:2449–2453; Pritchard 1984. Symp. Zool. Soc. London 52:87–110; Thomson 2003. http://www.chelonia.org/Articles/longneck_flathead_evolution.htm). *Chelodina oblonga* has a thick neck and, in relation to body size, the longest neck of all Australasian snake-necked turtles. Its food reportedly consists of small fish, shrimps, freshwater crayfish, aquatic insects, tadpoles, frogs, small water birds, carrion, and some plant material (Burbidge 1967. The Biology of South-western Australian Tortoises. Ph.D. Thesis, The University of Western Australia, Perth. 165 pp.; Cann 1998. Australian Freshwater Turtles. Beaumont Publishing, Singapore. 292 pp.).

On 28 and 29 December 2005 in the early afternoon I observed for several hours *C. oblonga* from a boardwalk across Tomato Lake, a suburban lake of Perth, Western Australia, while they were feeding on undetermined plankton that accumulated in clouds under the water surface at the sun/shade intersection caused by the boardwalk. In water depths of about 1–2 m several groups of 2–6 adult turtles of both sexes were stationary or swam slowly in the lower water zone and repeatedly extended their necks in slow motion upward into the plankton clouds while gaping the mouths wide open and maximally expanding the throats through water intake before closing the mouth to a crack, expelling most of the water and showing swallowing movements of the neck. Individual turtles repeated this behavior in intervals of about 20 seconds. These feeding behaviors of *C. oblonga*, with the necks slowly extending upward and the throats expanding before the necks were pulled back for swallowing, was reminiscent of the slow pulsating feeding movements of other plankton-feeding organisms like baleen whales and whale and basking sharks.. Thus, although the long neck, flat head, and wide throat of *C. oblonga* appear to be adaptations to catch fast-moving prey through a high speed strike combined with gape and suck feeding (Thomson, *op. cit.*), the species can also use its specialized neck and head morphology to ingest masses of slow-moving or near-stationary small planktonic organisms. Until now, this feeding behavior and food source has apparently not been reported for *C. oblonga* or other snake-necked turtles.

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CHELONIA MYDAS (Green Seaturtle). **NESTING.** Although Green Seaturtle juveniles have been documented in Virginia's waters, nesting has never been reported (Mitchell 1994. The Reptiles of Virginia. Smithsonian Inst. Press, Washington, D.C.). Excavation of an oviposition site and deposition of 124 eggs by a Green Seaturtle was observed at a public beach in the community of Sandbridge, City of Virginia Beach, Virginia, USA (36.71370°N, 75.93123°W, NAD 83), on 1 August 2005. Because the oviposition site was below the high-tide line and in a heavily used public recreation area, wildlife biologists from nearby Back Bay National Wildlife Refuge excavated the nest and relocated it to a secure site behind the primary dune line on the Refuge. Of the 124 eggs deposited, 120 were relocated. After an incubation period ranging from 58–63 days, 99 hatchlings emerged on 28 September 2005, one on 29 September, eight on 1 October, and six on 3 October (95% success rate). All were released on the same night of emergence. This is the northernmost record of an oviposition site for this species. The previous northernmost nesting record is ca. 77 km S of the Virginia/North Carolina line, near Nags Head, North Carolina (M. Godfrey, Sea Turtle Project, North Carolina Wildlife Resources Commission, pers. comm., 2005). Palmer and Braswell (1995. Reptiles of North Carolina, Univ. NC Press, Chapel Hill) noted that the northernmost locality was at Cape Hatteras, North Carolina. Photos (KU-CT 11959) were taken by Pam Gelman, verified by Joseph Mitchell, and deposited at the University of Kansas.

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CHELONIAN SPECIES. RECORD CARAPACE LENGTHS FOR ILLINOIS. Maximum sizes attained by turtles in various portions of their ranges are not often reported. We began trapping and nesting surveys of turtles in west-central Illinois, USA, in 1994 and continued through 2006. During that time we have collected data on 27,206 turtles of ten different species, a total that excludes data collected on hatchlings. In this note we present new state maximum size records (carapace length) for six Illinois species including a range-wide size record for the Red-eared Slider (*Trachemys scripta elegans*).

Turtles were collected in baited hoop traps, unbaited fyke nets, or by hand at nesting areas. Turtles were returned to the laboratory where they were marked, weighed, measured, and then released at the collecting area (Tucker et al. 1998. J. Herpetol. 32:294–298). Only the initial capture for each individual was included in the analysis. Maximum sizes were compared to those in Smith (1961. Illinois Nat. Hist. Surv. Bull. 28:1–298) and Phillips et al. (1999. Illinois Nat. Hist. Surv. Man. 8:xv, 1–282) for Illinois and to Ernst et al. (1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, D.C. 578 pp.) and Conant and Collins (1991. A Field Guide to Reptiles and Amphibians. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts. 450

Table 1. Descriptive statistics for ten species of turtles collected in west-central Illinois.

Species	N	Carapace Length Mean (std)/ range	Carapace Width Mean (std)/ range	Carapace Height Mean (std)/ range	Plastron length Mean (std)/ range	Mass Mean (std)/ range
Chelydra serpentina/ Snapping Turtle	468	27.0 (6.4) 3.2–40.5	23.0 (5.3) 3.1–32.5	11.6 (2.7) 1.9–16.8	20.1 (4.5) 2.3–29.7	5940 (3368.7) 10.9–16000
Apalone mutica/ Smooth Softshell	8	21.2 (5.8) 15.8–28.8	18.0 (4.5) 13.7–23.9	4.8 (2.2) 2.8–7.7	14.8 (4.2) 11.0–20.2	1071 (943.2) 265–2290
Apalone spinifera/ Spiny Softshell	416	23.2 (8.0) 4.8–50.0	19.2 (6.1) 4.2–39.6	5.1 (1.8) 1.2–11.5	16.5 (5.8) 3.2–32.5	1540 (1643.5) 11.2–9400
Sternotherus odoratus/ Stinkpot	633	10.2 (2.2) 2.4–14.6	7.3 (1.9) 1.6–17.6	4.3 (0.8) 1.2–9.9	7.6 (1.7) 1.7–10.7	205 (97.1) 3.1–510
Terrapene carolina/ Eastern Box Turtle	36	13.4 (0.8) 12.1–14.7	10.5 (0.7) 9.2–11.8	6.9 (0.5) 5.8–7.6	13.7 (0.8) 12.2–15.7	556 (110.0) 350–850
Chrysemys picta/ Painted Turtle	848	13.9 (2.7) 3.5–19.5	10.2 (1.7) 3.2–13.9	4.9 (1.0) 1.5–9.5	13.0 (2.5) 3.1–18.0	401 (187.7) 7.11–980
Trachemys scripta elegans/ Red-eared Slider	24682	18.1 (4.6) 3.0–30.2	13.5 (3.1) 3.0–21.7	6.7 (1.8) 1.4–12.5	16.7 (4.2) 2.7–26.7	984 (589.3) 6.2–3510
Graptemys geographica/ Northern Map Turtle	16	14.1 (4.1) 8.1–20.5	10.9 (2.9) 7.1–15.4	5.1 (1.8) 2.9–9.5	12.6 (3.8) 7.0–18.2	459 (374.0) 61–1100
Graptemys pseudogeographica/ False Map Turtle	22	14.1 (3.2) 10.4–21.0	10.7 (2.5) 8.5–17.4	4.8 (1.2) 3.8–7.5	12.4 (2.9) 9.2–18.9	387 (349.7) 160–1260
Graptemys ouachitensis/ Ouachita Map Turtle	45	13.5 (4.7) 6.9–24.3	10.3 (3.4) 6.1–17.8	5.0 (1.9) 2.7–9.3	11.7 (4.2) 6.0–21.0	445 (474.8) 45–1780

Measurements of length and height are in cm; mass is listed in g.

pp.) along with other more recent references cited below for the United States.

Dimensions for all captured turtles are listed in Table 1. State record carapace lengths were recorded for six species (Table 2). Illinois collecting sitess for each of the record-sized turtles are Swan Lake, Calhoun Co., for the Spiny Softshell (*Apalone spinifera*) and the Common Snapping Turtle (*Chelydra serpentina*); Spunky Bottoms, Brown Co., for the Red-eared Slider (*Trachemys s. elegans*) and the Painted Turtle (*Chrysemys picta*); the Illinois River adjacent to Swan Lake, Calhoun Co., for the Smooth Softshell (*Apalone mutica*); and Gilbert Lake, Jersey Co., for the Stinkpot (*Sternotherus odoratus*). Our size records for female Red-eared Sliders exceeded the previously reported range-wide record for females of 29.2 cm for a specimen from Missouri (Johnson 2000. The Amphibians and Reptiles of Missouri. 2nd ed. Missouri Department of Conservation, Jefferson City, Missouri. 400 pp.). Such large specimens are uncommon, and we collected only three individuals with a carapace length of 30 cm or greater among the more than 24,500

Table 2. Maximum carapace lengths (cm) for turtles from Illinois and the United States. Measurements are for females except where noted.

Species	Current study	Smith (1961)	Phillips et al. (1999)	Ernst et al. (1994)	Conant & Collins (1991)
Apalone spinifera	50.0	28.2	38	54.0	43.2
Apalone mutica	28.8	23.3	28.0	35.6	35.6
*Chelydra serpentina**	40.5	30	N	49.4	49.4
Chrysemys picta	19.5	16.6	18	20.3	25.1
Trachemys s. elegans	30.2	22.9	26	28	28.9
*T. s. elegans**	26.1	N	N	20	N
Sternotherus odoratus	14.6	12.8	13	13.7	13.7

Symbols: * data collected from males; N = not given.

individuals observed. However, other slider subspecies attain much larger carapace lengths (Ernst et al. 1994, *op. cit.*). Our state record for the Stinkpot (Tucker and Lamer 2005. Herpetol. Rev. 36:314) is just slightly smaller than the range-wide record of 15 cm (Ewert 2005. Herpetol. Rev. 36:314) for a specimen from Indiana.

The fairly large number of new state records that we report almost certainly reflects our intensive trapping program. Trapping was mostly conducted in backwaters of the Illinois River rather than in the river itself. Consequently, we caught few map turtles, which are generally riverine species (Dreslik and Phillips 2005. J. Freshwater Ecol. 20:149–164). Our collections of terrestrial turtles such as the Eastern Box Turtle (*Terrapene carolina*) were also small. This is an upland species and not common in the floodplain areas that we surveyed. In contrast, numbers of Sliders dominate our collections. Despite the small numbers of riverine specialists that we examined, we believe it is important to report these records because size in turtles is usually associated with reproductive output and can vary geographically (Iverson 1992. Herpetol. Monogr. 6:25–42; Tucker et al. 1998, *op. cit.*).

Brian J. Towey, Megan Dooling, and Mika Avara helped with trapping. Collecting at the Stump Lake was made possible by Neal Booth and Kim Postlewait (Illinois Department of Natural Resources) at the Mississippi River State Fish and Wildlife Area in Rosedale, Illinois. Access to Swan Lake and Gilbert Lake was made possible by John Mabery (US Fish and Wildlife Service) at the Two Rivers National Wildlife Refuge-Brussels District. Collections at Spunky Bottoms were funded by the Nature Conservancy and we thank Theron Hobson for his assistance. We also thank Jim Beasley, Beasley Fish of Grafton, Illinois for providing bait. Collecting was done under Illinois Department of Natural Resources scientific permit authorization to Tucker.

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CHELYDRA SERPENTINA (Common Snapping Turtle). **DIET**. *Chelydra serpentina* is an omnivorous species known to consume a variety of vertebrates, invertebrates, and vegetation (Ernst et al. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington D.C. 578 pp.; Palmer and Braswell 1995. Reptiles of North Carolina. UNC Press, Chapel Hill, North Carolina. 412 pp.). Clams and mussels have been listed among the invertebrates taken by *C. serpentina*, yet none has been identified to species. Here we report an instance of predation on a freshwater mussel and provide a positive identification of species.

One of us (SKH) captured a male *C. serpentina* (345 mm CL, 250 mm PL, 9.5 kg) in a small sandy pool near a culvert between two human-made ponds within the Auburn University North Fisheries Unit on 19 September 2005 ca. 3 km N of Auburn, in north-central Lee Co., Alabama, USA (UTM 16 641280E, 36 15474N; datum: WGS 84; elev. 200 m). Upon close examination of the turtle it was observed that freshwater mussel shell fragments were protruding from the cloaca, which appeared to be entirely blocked by this indigestible material. We removed several of the fragments and determined the mussel was *Utterbackia imbecillis*, the Paper Pondshell. *Utterbackia imbecillis* is an ecologically tolerant and widespread pearly mussel (Bivalvia: Paleoheterodonta, Unionoida; Unionidae), common in lentic bodies of water in the Mississippi River drainage basin and the basins of other rivers draining into the Gulf of Mexico (Parmalee and Bogan 1998. The Freshwater Mussels of Tennessee. University of Tennessee Press, Knoxville 328 pp.). The turtle was held for six days, during which time the remaining fragments were passed or removed with forceps. The total dry weight of the *U. imbecillis* shell fragments was 78 g. *Utterbackia imbecillis* shells are notably thinner than those of other unionids and closed shells containing decaying animals are often found floating on the surface of ponds and sluggish rivers during summer and early fall. Although it is possible that these mussels were taken on the substrate surface, we speculate that this turtle encountered and fed upon dead *U. imbecillis* found floating at the surface of these warm, shallow, nutrient-rich ponds.

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DEIROCHELYS RETICULARIA RETICULARIA (Eastern Chicken Turtle). **TERRESTRIAL REFUGIUM DURATION.** *Deirochelys reticularia* is an aquatic turtle known to hibernate and aestivate terrestrially (Buhlmann 1995. J. Herpetol. 29:173–181). Buhlmann and Gibbons (2001. Chelon. Cons. Biol. 4[1]:115–127) reported that, among 150 *D. reticularia* inhabiting a Carolina bay in South Carolina, terrestrial refugium duration ranged from 121–285 consecutive days, with an average of 185 days. Buhlmann (*op. cit.*) reported a maximum of 156 days spent in terrestrial refugia among six *D. reticularia* radio-tracked in a Virginia population. Here I report an exceptionally long use of terrestrial refugia by *D. reticularia*.

Between 6 September 1998 and 12 February 2006, I radio-tracked 17 *D. reticularia* alternately utilizing a large ephemeral pond, a permanent human-made lake and beaver swamp complex, and interlying terrestrial sandhill habitat, dominated by longleaf pine (*Pinus palustris*), wiregrass (*Aristida stricta*), and scrub oaks (*Quercus* spp.) (Sandhills Game Lands, ca. 17.7 km NW of Wagram, Scotland Co., North Carolina, USA). While all but two of the turtles spent at least some time on land while being tracked, two individuals remained in terrestrial refugia for exceptionally long periods.

A subadult female (straightline CL 109 mm, 177 g) was initially captured in the ephemeral pond on 13 May 2000, taken into the laboratory, fitted with a transmitter on 19 May, and released back into the pond on 20 May. On 26 May she was found in a terrestrial refugium ca. 390 m from the pond. On 28 May she was found to have moved ca. 6 m. She remained in that spot until 4–6 August; on 6 August she was found to have moved ca. 136 m. On 10 February 2001, I replaced her transmitter in the field. On 17 February she was found to have moved 2 m and an additional 11 m on 24 February. She remained in that spot until 13 April; on that date she moved ca. 119 m. On 2 June she was found to have moved ca. 31 m, following a prescribed burn that passed over her refugium between 28 May and 2 June. She remained in that location until at least 30 March 2002 (her transmitter was again replaced in the field on 27 January 2002). On 24, 29, and 30 March, she was found awake and alert with her head protruding from the leaf litter. On 6 April she was found in the permanent lake/beaver swamp complex, ca. 470 m from her most recent terrestrial refugium and ca. 700 m from the ephemeral pond where she was originally captured. She remained there until her signal was lost on 1 June 2002. This turtle spent a minimum of 674 consecutive days in terrestrial refugia—more than twice the maximum of 285 days reported by Buhlmann and Gibbons (*op. cit.*).

An adult female (CL 180 mm, 689 g) was initially captured while hibernating terrestrially on 24 February 2001, at a point ca. 200 m from the dry ephemeral pond and ca. 500 m from the lake/beaver swamp complex. She was taken into the laboratory, fitted with a transmitter on 2 March, and replaced in her terrestrial hibernaculum on 3 March. She remained in that spot until 18–25 May; on 25 May she was found to have moved ca. 104 m. She remained there until 2 June, when she was found to have moved ca. 36 m, following a prescribed burn that passed over her refugium between 28 May and 2 June. She remained in that spot until 13 April 2002 (her transmitter was replaced in the field on 18 November 2001). On that date she was found moving overland ca. 132 m from her most recent refugium, and on the following day she was found in the beaver swamp complex (ca. 500 m from her original capture site), where she remained until her signal was lost on 13 June 2002. This turtle endured a minimum of 413 consecutive days in terrestrial refugia (almost certainly considerably longer, as she had likely been in terrestrial aestivation/hibernation for several months before being found).

During most of the period these two turtles spent on land, the ephemeral pond was dry or nearly so. The remaining 15 turtles tracked in this population spent periods ranging from zero to at least 259 consecutive days in terrestrial refugia. In all cases, terrestrial refugia were shallow depressions dug by the turtles at, or up to ca. 5 cm below, the surface of the sandy soil. In most cases, when only the surface litter was brushed aside, the top of the turtle's carapace was visible. On the few occasions when I disturbed them, the turtles always appeared awake and would move if touched, even in very cold weather. On at least three occasions, prescribed fires passed directly over turtles without harming them, though the surface litter and survey flags marking the turtles' locations were consumed. Turtles were monitored opportunistically at fairly frequent intervals (an average of ca. every 4–5 days) while in terrestrial refugia, and there was little or no possibility of their having moved to water and then back to their refugia during the short intervening periods.

These observations indicate that *D. reticularia* is strongly drought-resistant and capable of enduring periods of nearly two years in terrestrial refugia. Why some turtles exhibited this behavior rather than moving directly into the lake/beaver swamp complex is unknown. Possibly the permanent water was perceived as suboptimal habitat and only entered as a "last resort" when energy reserves were nearly depleted; however, several individuals migrated directly from the ephemeral pond to the permanent lake, covering the distance (a minimum of ca. 670 m) in less than 24 h.

For support and assistance, I thank the North Carolina State Museum of Natural Sciences, North Carolina Herpetological Society, Wake Audubon Society, Three Lakes Nature Center and Aquarium, North Carolina Wildlife Resources Commission, and the many individuals who assisted with field work—especially Stanley L. Alford, L. Todd Pusser, and Thomas J. Thorp.

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GLYPTEMYS INSCULPTA (Wood Turtle). **GENERATIONAL TWINNING**. Twinning has been reported for several species of North American freshwater turtles (Plymale et al. 1980. Florida Sci. 43:97–102; Tucker and Jansen 1997. Copeia 1997:166–173). Twinning in *Gyptemys insculpta* has been reported at least once (Oldfield and Moriarty 1994. Amphibians and Reptiles Native to Minnesota. University of Minnesota Press. 131 pp.) previous to this report. The twin turtles in that report were captive-hatched from a wild-caught gravid female in August 1985.

One of the 1985 twins was raised in captivity and bred annually to a captive-bred female of similar age since 1996. In June 1997, this pair produced a clutch of seven eggs. Three of the eggs were fertile. One of the fertile eggs failed after about 40 days of incubation, one hatched normally at 70 days, and one had not hatched at 90 days. The unhatched egg was opened and found to contain one small live embryo and one dead embryo attached to the same yolk (JFBM 13514). Both embryos appeared normal. None of the subsequent seven clutches from this pair of turtles has produced twins.

This is the first published record of generational twinning in turtles. Previous studies (Tucker and Janzen 1997, *op. cit.*; Yntema 1970. Anat. Rec. 166:491–498; Yntema 1971. Copeia 1971:755–758) only looked at twins produced from wild nests. Additional studies will be needed to determine if generational twinning is genetically based or due to chance developmental anomalies.

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GLYPTEMYS INSCULPTA (Wood Turtle). **DIET.** North American Wood Turtles are known to feed opportunistically on a variety of plant and animal species. Food preferences may differ geographically and shift seasonally but include a variety of green leaves, fruits, flowers, fungi, and invertebrates (Ernst et al. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington D.C. 578 pp.; Farrell and Graham 1991. J. Herpetol. 25:1–9; Strang 1983. J. Herpetol. 17:43–47). As part of a larger study analyzing home range, movement patterns, and microhabitat usage, I used radio telemetry to observe 15 adult *G. inscuplta* in Butler Co., Iowa (at the southwestern limit of the species' range) from May 2003 to May 2006 and noted feeding events and food sources when possible. Noted Wood Turtle food sources in Butler Co. (listed in order of frequency of observation) included grasses, slugs, violet leaves (*Viola* sp.), prairie ragwort leaves (*Senecio plattensis*), black raspberries (*Rubus* sp.), earthworms, snails, and dandelion leaves (*Taraxacum officinale*). To date, *S. plattensis*, a plant with toxic properties, has not been reported as a food item for *G. insculpta*.

Senecio (=*Packera*) *plattensis* [Asteraceae] is distributed broadly from the east coast to the midwest of North America; its range overlaps with *G. insculpta* in Iowa, Michigan, Minnesota, New Hampshire, Pennsylvania, West Virginia, Wisconsin, and Virginia. *Senecio plattensis* occurs frequently within the study sites in Butler Co., Iowa; it is found in sandy soil and commonly occurs in clearings in the forest canopy with a variety of grasses, sedges, and forbs, and along riverbanks in mixed species assemblages dominated by *Salix* spp. (saplings) and *Bromus* spp. (grasses). Wood Turtles in Butler Co. frequently utilize both of these microhabitats.

Senecio spp. are known to contain a variety of toxic pyrrolizidine alkaloids (otocecine-type: senkirkine, hydroxysenkirkine, and petasitenine; and retronecine type: jacobine, isatidine, retrorsine, riddelliine, senecionine, and seneciphylline) that are variously hepatotoxic, genotoxic, tumorigenic, carcinogenic, and mutagenic (Fu et al. 2004. Drug Metabolism Reviews 36:1–55). Pyrrolizidine alkaloids (PAs) are produced by over 6000 members of several plant families (Asteraceae, Boraginaceae, Leguminosae) and are reported to be the most common poisonous plant compounds that affect wildlife, livestock, and humans worldwide (Steenkamp et al. 2000. Ther. Drug. Monit. 22:302–306; Stegelmeier et al. 1999. J. Nat. Toxins 8:95–116).

I have only witnessed *G. insculpta* feeding on the ovate basal leaves at ground level, despite the availability of flower heads on short stems. For example, an adult male Wood Turtle (923.6 g, carapace length 186.14 mm) was observed on 15 May 2004 feeding on prairie ragwort; the turtle ate the majority of several basal leaves from two adjacent plants between 1611 h and 1624 h, then moved 0.5 m and partially consumed a dandelion leaf (*Taraxacum officinale*) at 1633 h. The turtle then moved 1.5 m and basked in a stand of willow saplings (*Salix* spp.) until 1740 h. After basking, cloacal temperature was 26.2°C; air temperature was 18.4°C.

Eight adult (two males and six females) *G. inscuplta* have been observed feeding on *S. plattensis* between May 2004 and April 2006. Several individuals have been observed to feed repeatedly on *S. plattensis* and to date none has shown visible signs of acute or chronic toxicity. Of over 870 sightings on 46 marked turtles between May 2003 and May 2006, I have observed only two fatalities, neither related to ingestion of *S. plattensis*.

Pyrrolizidine alkaloid poisoning is apparently unreported for herbivorous reptiles, but is well-documented in numerous insect, fish, bird, and mammal species (Candrian et al. 1984. Food Chem. Toxicol. 22:223–225; Chan et al. 2003. Toxicol. Lett. 144:295–311; Cheeke and Pierson-Goeger 1983. Toxicol. Lett. 18:343–349; Hendricks et al. 1981. Exp. Mol. Pathol. 35:170–183). Barnard (1996. Reptile Keeper's Handbook. Krieger Publ. Co., Malabar, Florida) includes *Senecio* spp. on a list of plants that are poisonous to reptiles, but apparently this is based on toxicity to humans. To my knowledge, it is undetermined if herbivorous reptiles, particularly turtles, exhibit toxicity upon ingesting PAs or if toxicity might be mitigated by enzymatic or bacterial alteration of the toxins.

Funds for equipment were provided by the Department of Biology, University of Northern Iowa, and the Minnesota Herpetological Society. This research was conducted under scientific collecting permit SC-648, Iowa Department of Natural Resources.

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GEOCHELONE CARBONARIA (Red-footed Tortoise). **SWIMMING.** The presence of tortoises (Testudinidae) on islands and both sides of large river systems suggests that they must be capable of swimming or, at a minimum, floating to facilitate passive transport in currents. It has been suggested that tortoises float due to their high carapace height-to-width ratios (Patterson 1973. J. Herpetol. 7:373–375), yet few published accounts exist that document swimming activity by tortoises. Swimming accounts have been published for *Geochelone nigra* (Beebe 1924. Galapagos World's End. Putnam's Sons, London), *Gopherus polyphemus* (Brode 1959. Herpetologica 15:101–102; Carr 1952. Handbook of Turtles: The Turtles of the United States, Canada, and Baja California. Cornell Univ. Press. Ithica, New York), *Geochelone (Testudo) gigantea* (Gaymer 1968. J. Zool. 154:341–363), and *Testudo graeca* (Gasith and Sidis 1982. Copeia 1982:200–201). Although these tortoises are not particularly well-shaped for swimming, several of these authors noted that the tortoises float quite buoyantly, are capable of keeping their head above water, and are capable of controlling their direction of movement, in some cases in the presence of a current (Brode, *op. cit.*; Carr, *op. cit.*; Beebe, *op. cit.*; Gaymer, *op. cit.*).

On 17 May 2006, at 1650 h, an adult female *G. carbonaria* (ca. 35 cm linear carapace length) was observed swimming across the Uraricoera River (a third-order tributary to the Amazon River, located in Roraima State, northern Brazil) from the mainland to the 110,000 ha riverine island, Maracá Ecological Reserve. The tortoise was observed by JNS from a boat for ca. 10 min as it was carried downstream by the current, yet making progress towards the opposite bank of the 150 m wide river, as it alternately paddled with its forelimbs. The tortoise's head and top one-third of its carapace were above water (Fig. 1), but when approached too closely, the tortoise stopped swimming and held its head below water for ca. 30 sec. A juvenile *G. carbonaria* of unknown sex (22 cm linear carapace length) was also observed swimming and was captured for measurement in the same river as it arrived close to the island shore at ca. 1300 h on 12 June 2004.

The island towards which both of these tortoises were swimming has both *G. carbonaria* and *G. denticulata*, suggesting that both species are capable of swimming, although this is yet to be documented for the latter. To our knowledge, this is the first report

FIG. 1. Female *Geochelone carbonaria* swimming across the Uraricoera River, Roraima State, northern Brazil, 17 May 2006.

of *G. carbonaria* actively swimming.

Research in 2004 was supported by grants from the Wildlife Conservation Society Research Fellowship Program, Chelonian Research Foundation Linnaeus Fund, and Sigma Xi Grants in Aid of Student Research to JNS. We thank F. A. Franco de Medetrus for observations of the juvenile tortoise.

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HEOSEMYS SPINOSA (Spiny Hill Turtle). **DIET**. *Heosemys spinosa* is reportedly primarily herbivorous in the wild, though captives accept both plant and animal matter (Lim and Das 1999. Turtles of Borneo and Peninsular Malaysia. Natural History Publications [Borneo] Sdn. Bhd., Kota Kinabalu. xii + 151 pp.; Pritchard 1979. Encyclopedia of Turtles. TFH Publications, Neptune, New Jersey. 895 pp.). However, apparently there are no published studies on the natural diet of this species. Fecal samples from four individuals (two females, one male, one juvenile) were analyzed for content. Three animals (a male, a female, and a juvenile) originated from Kubah National Park (01°33'N, 110°12'E), Sarawak, Malaysia (Borneo). A fourth (a female) was from the vicinity of Balai Ringin (01°03'N, 110°45'E), a fishing village also in Sarawak. The three individuals from Kubah had seeds of an indeterminate type of plant as well as other plant material, and parts of indeterminate insects. The fecal sample from the adult female from Balai Ringin contained plant material, unknown insect parts, vertebrae from an unidentified fish species, several phalanx bones from a monkey, either a macaque (*Macaca* sp.) or a langur (*Presbytis* sp.), presumably taken by scavenging.

We thank the Sarawak Biodiversity Centre for permission to collect turtles and the Sarawak Forest Department and Sarawak Forestry Corporation for support. The Universiti Malaysia Sarawak supported our research on the turtles of Borneo through grant number 1/26/303/2002 (40), and the Earl of Cranbrook and Phil Piper assisted with the identification of the primate bones.

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HYDROMEDUSA TECTIFERA (South American Snake-necked Turtle). **ALTITUDINAL RECORD**. The geographic distribution of South American snake-necked turtles (*Acantochelys radiolata*, *Hydromedusa maximiliani*, *H. tectifera*, and *Phrynops hogei*) and their habitat preferences are still inadequately defined, and these turtles' populations are being reduced because of environmental disturbances (Ernst and Barbour 1989. Turtles of the World. Smithsonian Institution Press, Washington, DC 313 pp.; Rocha et al. 2000. *In* Bergallo et al. [Orgs.], A Fauna Ameaçada de Extinção do Estado do Rio de Janeiro, pp. 79–87. EdUERJ). These species typically inhabit rivers, lakes, and swamps along the coastal lowlands from Brazil to Argentina (Achaval and Olmos 2003. Anfíbios y Reptiles del Uruguay. 2da. Edición corregida y aumentada. Graphis, Montivideo, Uruguay. 136 pp.; Ernst and Barbour, *op. cit.*; Pritchard 1979. Encyclopedia of Turtles. TFH Publ. Co., Neptune, New Jersey. 895 pp.). On 15 September 2001 at 0915 h, a male *Hydromedusa tectifera* (carapace length ca. 20 cm) was found resting underwater (water temperature 17.8°C) at a depth of 50 cm at the Poço Verde (22°30'S, 43°02'W; 450 m elev.), in the Parque Nacional da Serra dos Órgãos, Rio de Janeiro State, Brazil. The turtle was captured and identified for JALP and JPF, photographed, and then released. This finding constitutes the highest elevation for which this species has been recorded.

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KINOSTERNON SCORPIOIDES ALBOGULARE (White-throated Mud Turtle). **FEEDING BEHAVIOR AND DIET.** The feeding behavior and diet of *Kinosternon scorpioides albogulare* was studied at the Caribbean island of San Andres, Colombia, during a survey of the population conducted from March to July 2002. On this island these turtles inhabit both freshwater ponds and mangroves, with more than 98% of the total population living in the latter (Forero-Medina, Chelon. Cons. Biol., *in press*). Direct observations on feeding behavior were conducted during the study, and stomach flushing (Legler 1977. Herpetologica 33:281–284) was used on 50 individuals for determining dietary composition. Stomach contents were preserved in alcohol, and the items were identified to taxonomic category. The turtles displayed both diurnal and nocturnal feeding activity. A nocturnal pattern occurring at the fresh water ponds, where it is almost impossible to observe an individual during the day. In the mangroves, however, they were frequently seen active during the day. Most of the stomachs were found to be empty, but some of them contained identifiable items. These included seeds, coleopteran elytra, small gastropods, arthropods, and larval crustaceans (zoea) and dipterans. These last two items were found in large quantities in some specimens. During observed feeding events, the identified prey were a small fish and an aquatic coleopteran in the freshwater ponds, and a fruit (*Annona* sp.) on the floor of a mangrove habitat. Turtles were also frequently observed ingesting organic wastes such as coconut leftovers, disposed by people living next to the mangroves. These results suggest that the species is omnivorous and opportunistic and that it uses resources such as fruits or arthropods depending on their availability.

Feeding in *K. s. albogulare* can be terrestrial or aquatic. Carr and Mast (1988. Trianea [Act.Cient.Tecn. INDERENA] 1:87–97) suggested that the terrestrial invertebrates consumed by *K. herrerai* had likely fallen onto the water; however, our observations on *K. s. albogulare* confirm both aquatic and a terrestrial feeding behavior. A notable item found in the diet of some individuals is a large quantity of dipteran larvae. A study on the feeding behavior of *K. s. cruentatum* (Monge-Najera and Moreva-Brenes 1987.

Herpetol. Rev. 18:7–8) found a strong preference for eating mosquito larvae; one individual consumed 148 in 24 h. These results suggest that turtles could play a role in the control of mosquitoes on the island. They could also be contributing to nutrient cycling processes in the mangroves as they consume organic waste and dead animals such as crabs, as observed by one of us (Castaño, unpubl.). Continued studies may reveal additional items consumed by the species and seasonal and temporal changes in dietary preferences.

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PHRYNOPS HILARII (Hilaire's Side-necked Turtle). **REPRODUCTION.** A number of factors are known to influence the incubation time and size of chelonian neonates (Kohler 2005. Incubation of Reptile Eggs. Krieger Publ. Co., Malabar, Florida. 214 pp.). However, much reported data is based on artificially incubated eggs, where eggs are exposed to constant temperatures during the incubation period. Here I present data on the longest known incubation period of a *Phrynops hilarii* clutch in non-controlled environment.

A female *Phrynops hilarii* was found after it had been hit by a vehicle in a road in southern Rio Grande do Sul state, Brazil. The animal was still alive but later died in the laboratory. This female had a carapace length (CL) of 338 mm, plastron length of 299 mm, and a body mass of 3600 g. Upon necropsy, fourteen intact eggs were found in its oviducts, six in the right side and eight in the left side. Egg measurements showed low variability, both in diameter (greater dimension: mean = 33.6 ± 0.477, lesser: mean = 32.0 ± 0.350) and weight (mean = 20.5 ± 0.489 g). Total egg mass represented approximately 9% of the body mass of the female. Initially, egg viability was considered unlikely, and the eggs were placed in a closed jar and kept on a shelf exposed to ambient room temperatures. This room was heated during the coldest winter months, while in summer, air conditioning was turned on only during working hours in the laboratory.

Of the 14 eggs placed in the jar, 10 hatched successfully, one hatchling died during hatching, two eggs contained dead embryos in different stages of development, and one was classified as non-viable due to absence of visible embryonic development. Hatching was verified after a period of 418 days. Of the 10 successful hatchlings, CL of nine ranged between 41 and 42.6 mm, and one was notably smaller at CL 38.8 mm (N = 10; mean = 41.3; SD = 1.03; Min. = 38.8; Max. = 42.6). No abnormalities in scute pattern were observed. Incubation periods of 100–300 days have been reported for turtles in this genus, with ± 150 days being noted for captive-bred *P. hilarii* (Fabius 2004. Manouria 7[25]:28–38). Reports that this species might deposit eggs during two laying periods in fall and spring (March–May, September–December) with a single hatching period in late summer or fall suggests that *P. hilarii* embryos might enter a state of diapause under certain conditions (R .Vogt, pers. comm.; Fabius, *op. cit.*). This might explain the survival of embryos under presumably stressful conditions and extended incubation period reported here.

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TRACHEMYS SCRIPTA ELEGANS (Red-eared Slider). **REPRODUCTION.** The natural range of *Trachemys scripta elegans* is centered in the south-central United States, from Illinois to the Gulf of Mexico. Because of its prominence in the international pet trade, the species now can be found over much of the United States, and its introduction has been documented throughout the world (Ernst et al. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington. 578 pp.). There has been speculation as to whether and where introduced Red-eared Sliders can reproduce in the wild in California (Bury and Luckenbach 1976. Biol. Conserv. 10:1–14). Successful nesting or presumed breeding (i.e., gravid females) in northern California were reported by Bury and Luckenbach (*op. cit.*) at Clear Lake, by Spinks et al. (2003. Biol. Cons. 113:257–267) at the University of California, Davis, and by Fidenci (2006. Herpetol. Rev. 37:80) in the Mount Tamalpais Watershed, Marin Co. Here, we report additional evidence of reproduction in *T. s. elegans* in the wild in northern California.

On 27 April 2001, MPB and R. Corwin found a hatchling *T. s. elegans* in a fyke net set for salmonid surveys at Stony Creek, immediately upstream from its confluence with the Sacramento River, Glenn Co.. This area is southeast of the city of Orland. The turtle was 41 mm CL (straight-line carapace length). On 31 May 2001, in a slough about one mile east of Stony Creek, GML captured a hatchling *T. s. elegans* (53 mm CL). In this same remote area, GML has captured, marked, and released 88 *T. s. elegans*, seven of which were <100 mm CL. Over the course of a two-year mark-recapture study in 2004 and 2005 on the eastern half of the Bufferlands in Elk Grove (city), Sacramento Co., LCP captured 240 individual *T. s. elegans*, 18 of which were <100 mm CL (smallest = 34.6 mm CL). On 17 June 2005, E. Meyer, W. Wegner, and D. Degross visited a pond on the north side of the Sacramento River, Redding (city), Shasta Co. Several adult *T. s. elegans* and Pacific Pond Turtles (*Actinemys marmorata*), the native turtle, were observed basking on logs in the pond. One adult male *T. s. elegans* (139 mm CL) was captured in a small turtle trap baited with canned sardines. One hatchling *T. s. elegans* (34.8 mm CL), of four observed basking on a log in the shallows, was captured with a dip net.

The observation of multiple hatchling and juvenile *T. s. elegans* reported here, along with previously cited reports, suggests that successful reproduction is occurring in the wild in northern California and that these young turtles were wild-bred and not released pets.

Stebbins (2003. Western Reptiles and Amphibians. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts. 533 pp.) noted that *T. s. elegans* has been introduced into California's Central Valley (Sacramento-San Joaquin drainages). This watershed encompasses a considerable proportion of lowland habitats and, until recently (see Fidenci, *op. cit.*), included all of the prior and present cases of successful breeding of *T. s. elegans* in northern California. To date, known cases of reproduction in *T. s. elegans* in northern California are in or near urban areas, where it is more likely that pet turtles will escape or be released. The mild Mediterranean climate of the Central Valley may facilitate the survival and successful breeding of introduced *T. s. elegans*. With these additional sightings of reproduction in northern California, it appears that established populations of *T. s. elegans* are more widespread than previously recognized. Further research should focus on whether introduced populations of Sliders are a potential threat to the native *A. marmorata*.

Research was conducted under Scientific Collecting Permits from the California Department of Fish and Game, under authorization of the Department of Water Resources, and with approval to conduct surveys in the City of Redding and Sacramento County. We thank Richard Corwin, Doug Degross, Erik Meyer, and Willow Wegner for their help in the field.

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CROCODYLIA

CAIMAN CROCODILUS (Spectacled Caiman). **PREDATION/EAVESDROPPER.** The use of mating signals by unintended receivers, or eavesdroppers, is a widespread phenomenon and has been documented in several signal modalities (Zuk and Kolluru 1998. Quart. Rev. Biol. 73:415–438). Several predators and parasites use mating calls of other species to locate their prey/host. Male frogs calling to find a mate are known to attract predators such as frog-eating bats (*Trachops cirrhosus*: Tuttle and Ryan 1981. Science 214:677–678; Ryan and Tuttle 1983. Anim. Behav. 31:827–833) and opossums (*Philander opossum*: Tuttle et al. 1982. Biotropica 13:233–234), and parasites such as blood-sucking flies (*Corethrella* spp.: McKeever 1977. Mosquito News 37:522–523). Here, I report observations of eavesdropping on advertisement calls of frogs and toads by *Caiman crocodilus* from Gamboa (9°07.0'N, 79°41.9'W, datum: WGS84; elev. 35 m), Panama.

The diet of *C. crocodilus* includes a wide variety of foods; young caiman eat mostly aquatic arthropods (insects and crustaceans), whereas adults feed mainly on fishes and frogs (Savage 2002. The Amphibians and Reptiles of Costa Rica. University of Chicago Press, Chicago. 934 pp.). Yet, no reports exist on what cues caimans use to find the frogs they eat. Given that *C. crocodilus* hunt at night when most frogs call, their use of prey-emitted cues seems likely. *Caiman crocodilus* are known to be attracted to distress calls of the Smokey Jungle Frog, *Leptodactylus pentadactylus* (LeVering 1999. Unpubl. Ph.D. dissertation, University of Texas, Austin). LeVering (*op. cit.*) showed that *L. pentadactylus* frogs under attack produce distress calls that resemble the calls produced by young caimans. Such distress calls attract adult Spectacled Caimans, some of which interfere and may increase the probability of the frog escaping.

Between 1 and 14 August 2005, I observed the responses of two adult and two juvenile *C. crocodilus* to playbacks of frog advertisement calls. I broadcast calls of four species of frogs common in the area of Gamboa (Panama) from a speaker placed at ground level. I played a series of calls of 5–10 individuals of each species for 30 min with the purpose of trapping blood-sucking flies, *Corethrella* spp., that are attracted to advertisement calls of frogs. Only calls of one frog species were played during each 30-min interval, and calls were presented at the call rate at which they were originally recorded.

When I was setting up the trap to collect flies between 2010 and 2245 h on 1 August 2005, I noticed an adult (ca. 200 cm TL) *C. crocodilus* in a small pond 10–12 m from the pool of water next to which I had placed the trap. I first broadcast calls of *Eleutherodactylus diastema*, a small arboreal frog, and only a few *Corethrella* flies were attracted. I then played the calls of *L. pentadactylus*, and when I returned to close the trap I found an adult *C. crocodilus* by the trap, looking directly at the speaker (Fig. 1). The caiman had displaced the speaker about 10 cm and claw marks were present on the ground nearby. When I approached the trap, the caiman went back to the pond where I originally saw it at the beginning of the evening. After that, I played calls of *Agalychnis callidryas*, a slender medium-sized treefrog, but did not attract caiman. Finally, I broadcast calls of the toxic toad *Bufo marinus* and a caiman, apparently the same one based on overall morphology, approached the speaker again. On 10 August 2005, another adult (ca. 170 cm TL) caiman in an area about 100 m away approached a speaker playing *B. marinus* calls. On both nights, the caimans that approached the speaker moved it with their head and feet and scratched the area around it with their claws. On 2 and 14 August 2005 between 2000 and 2200 h, I broadcast calls of *L. pentadactylus* and *B. marinus* at 30-min intervals to juvenile caimans (ca. 70 cm TL) that were within 7–10 m of the speaker. In no case did the small caimans move in the direction of the calls.

FIG. 1. Adult *Caiman crocodilus* attracted to a speaker broadcasting *Leptodactylus pentadactylus* calls. The trap was originally intended to attract *Corethrella* flies.

These observations suggest that adult *C. crocodilus* use advertisement calls of frogs to locate their prey. Further, they seem to selectively approach terrestrial frogs large enough to offer a substantial meal (e.g., *L. pentadactylus* and *B. marinus*). Studies that further investigate caiman prey selectivity based on advertisement calls of frogs are necessary to confirm this observation. Crocodilians other than Spectacled Caimans are known to feed on frogs and toads (*Crocodylus acutus*: Savage, *op. cit.*; *Crocodylus moreleti*: Perez-Higareda et al. 1989. Copeia 1989:1039–1041). For instance, Morelet's Crocodiles have a diverse diet that includes *B. marinus* and *Rana vaillanti* (Perez-Higareda et al., *op. cit.*). Hence, use of prey-emitted cues by crocodilians that feed heavily on anurans deserves exploration.

These observations were possible thanks to the support of the Smithsonian Tropical Research Institute (STRI) through a fellowship conducted to study *Corethrella* flies in the same area. I thank Bill Wcislo for his support as STRI sponsor and Mike Ryan for referring me to the study done by Kate LeVering. Marc Hayes provided valuable comments that improved this manuscript.

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LACERTILIA

ANOLIS ALLISONI (Allison's Anole/Camaleón Azul). **NECTAR FEEDING**. As recently as the ecological review in Schwartz and Henderson (1991. Amphibians and Reptiles of the West Indies: Descriptions, Distribution, and Natural History. University of Florida Press, Gainesville. 720 pp.), nectarivory among anole lizards remained undocumented. Yet, over the last decade, more attention has been paid to lizard behavior when they are near flowers, resulting in scattered evidence for polychrotid lizards feeding on nectar and/or pollen (e.g., *Anolis carolinensis*: Bartlett 1995. Reptiles 2:48–65; Himes 1998. Herpetol. Rev. 29:236; Campbell and Bleazy 2000. Herpetol. Rev. 31:239; *A. conspersus*: Echternacht et al. 2000. Herpetol. Rev. 31:173; *A. grahami*: Losos and Queiroz 1997. Natural History 108:34–39; *A. porcatus*: Townsend 2003. Herpetol. Rev. 34:141–142; and *A. stratulus*: Perry and Lazell 1997. Herpetol. Rev 28:150–151). Cuban anoles may seem an exception to this pattern, but the many dietary studies on Cuban anoles, based almost entirely on stomach contents analyses (e.g., review in Rodríguez-Schettino 1999. The Iguanid Lizards of Cuba. University of Florida Press, Gainesville. 384 pp.) rather than behavioral observations, have provided little opportunity to record nectarivory. However, two anoles native to Cuba have been identified as nectar feeders in Florida: *A. porcatus* (an introduced species) on the ornamental Areca Palm (*Chyrsalipedocarpus lutescens*; Townsend, *op. cit.*), and the native *A. carolinensis* on two native palms: *Serenoa repens* and *Sabal palmetto* (Campbell and Bleazy, *op. cit.*). For this reason, I document nectarivory in *A. allisoni* in Cuba.

Between 0830 and 0930 h on 17 June 2003, I observed several females and juveniles of *A. allisoni* lapping nectar from the flowers of the ornamental palm 'Adonidia' (*Veitchia merrillii*, Arecaceae) in a garden in the Balcón de la Sierra (Bartolomé Masó). This palm is native to the Philippines but is common in Cuba (Leiva 1999. Las Palmas en Cuba. Ed. Científica-Técnica. La Habana, Cuba. 84 pp.). In this garden, *A. allisoni* is relatively abundant, and the species is often seen (often 3–4 on the same trunk) climbing these palms at heights < 2 m. On 10 occasions, females and juveniles were observed visiting flowers for nectar. Although several males were present in different palms at similar heights as females and juveniles, I never observed them visiting flowers during this period. My observation is similar to behavioral data obtained in captivity, where juveniles of different Cuban anoles have been observed feeding on nectar directly from flowers (L.V. Moreno, pers. comm.). In this garden, flowers of *V. merrillii* were also frequently visited by honeybees, but I did not observe aggressive interactions between lizards and bees, although on one occasion, a juvenile *A. allisoni* left when a honeybee arrived at the same flower. Remaining lizard-plant interactions occurred without *Apis mellifera* presence.

An insectivorous diet has been reported for *A. allisoni*, both in island (Cuba) (Rodríguez-Schettino, *op. cit.*) and mainland (Mexico) situations (Lee 1996. The Amphibians and Reptiles of the Yucatan Peninsula. Comstock Publ. Assoc., Ithaca, New York. 500 pp.). This observation documents a new example of lizard nectar feeding in island habitats, where this phenomenon has been observed relatively more frequently than in mainland situations (Olesen and Valido 2003. Trends Ecol. Evol. 18:177–181), and where lizards have the potential to act as pollinators. Lizard pollination of plants has been experimentally demonstrated in but a few cases (e.g., the lacertid *Podarcis lilfordi* from the Balearic Islands [Traveset and Sáez 1997. Oecologia 111:241–248; Pérez-Mellado and Casas 1997. Copeia 1997:593–595], and the scincid *Niveocincus microlepidotus* in Tasmania [Olsson et al. 2000. Biol. J. Linn. Soc 71:191–202]), but together with scattered indirect evidence from New Zealand (Whittaker 1987. New Zealand J. Bot. 25:315–328; Eifler 1995. Oecologia 101:228–233), Mauritius (Nyhagen et al. 2001. J. Trop. Ecol. 17:755–761), the Canary Islands (Fong and Ferrer 1995. Herpetol. Rev. 26:35–36; Valido et al. 2002 Acta Oecologica 23:413–419), New Caledonia (Bauer and Sadlier 2000. The Herpetofauna of New Caledonia. SSAR Publications, Ithaca, New York. 310 pp.), and the Seychelles (Cheke 1984. *In* Stoddart [ed.], Biogeography and Ecology of the Seychelles Islands, pp. 331–360. W. Junk Publishers, The Hague), these observations imply that greater attention should be paid to the possibility of lizard pollination (Proctor et al. 1996. The Natural History of Pollination. Harper Collins, London. 479 pp.).

Here, I reported nectarivory by a Cuban anole on an exotic palm. However, if we consider the abundance of palms in Cuba (about 80 native species; Leiva, *op. cit.*) along with the ability of *Anolis* to exploit nectar from palm flowers and hummingbird feeders (*A. carolinensis*: Liner 1996. Herpetol. Rev. 27:78), or bottles of honey left open in houses in Cuba (*A. porcatus*: A. Fong., pers. comm.), interactions between anoles and native palms that involve nectarivory and perhaps pollination should be expected.

I thank Lourdes Rodríguez-Schettino, Luis Moreno, and Ansel Fong for their assistance on Cuban anole information, and Ramona Oviedo and Gabriel Brull for hospitality and palm identification. Funding was provided by Marie Curie grant (MCFI-2000-1995).

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ANOLIS SAGREI (Cuban Brown Anole). **PREDATION**. Native to Cuba and the Bahamas, *Anolis sagrei* was first observed in the Florida Keys in the 1880s, and by the 1970s had spread across Florida (Meshaka et al. 2004. The Exotic Amphibians and Reptiles of Florida. Krieger Publishing, Malabar, Florida. 155 pp.). *Anolis sagrei* seems to flourish in disturbed habitats but can inhabit nearly any habitat in Florida (Campbell 2003. Herpetol. Rev. 34:173–174). Little is known of the ecology of its introduced populations, but indigenous predators may have a controlling effect. Here we report the first observation of a Red-shouldered Hawk (*Buteo lineatus*) preying on *A. sagrei*.

At ca. 1400 h on 7 May 2006, we observed an adult *B. lineatus* capture and eat an adult (ca. 14 cm total length) *A. sagrei*. Our observation was made in an old-growth cypress (*Taxodium distichum*) strand on the edge of a small (ca. 10 × 10 m) pool, located near the end of the Big Cypress bend boardwalk (25°56'49"N, 81°28'9"W, datum NAD 83: elev. 2 m) in Fakahatchee Strand State Park. We initially saw the hawk in flight, then it perched ca. 3 m above the ground on a *T. distichum* branch. It remained in this position for ca. 15 min, then flew down to the ground and seized the body of the *A. sagrei* with its talons. The *A. sagrei* was quickly consumed whole and the hawk flew to another perch and preened its talons and flight feathers. From capture to ingestion, the episode took ca. 50 sec.

Prior to this observation, the Broad-winged Hawk (*Buteo platypterus*) was the only other raptor reported to prey on *A. sagrei* in Florida (Meshaka et al., *op. cit.*). *Buteo lineatus* forages both above and below the canopy, searching for prey from the air or a perch (Stevenson and Anderson 1994. The Birdlife of Florida. University Press of Florida, Gainesville, Florida. 892 pp.). The wide variety of prey items in the diet of *B. lineatus* indicates that it is not a prey specialist (Stevenson and Anderson, *op. cit.*; Bednarz and Dinsmore 1985. Can. Field Nat. 99:262–264). The diet may change seasonally in relation to food availability, but mammals, lizards, and amphibians are the most common categories of prey items delivered to nests (Bednarz and Dinsmore, *op. cit.*). We commonly found *B. lineatus* perched on branches in old-growth cypress strand, a kind of diurnal perch at which individuals are cryptic. In Florida, A. *sagrei* perches in trees and shrubs but is most often found close to, or directly on, the ground (Meshaka et al., *op. cit.*) and will escape by running along the ground, perhaps in part because the primary predator avoidance behavior is avoiding a predator's visual field (Regalado 1998. Carib. J. Sci. 34:211–217). The use of uncovered microhabitat by *A. sagrei* increases its likelihood of predation by this Florida raptor.

We thank Marc Hayes and Walter Meshaka for suggested revisions to the text.

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ARTHROSAURA RETICULATA (Reticulated Creek Lizard). **PREDATION.** The Amazon Fishing Spider (*Ancylometes rufus*, Pisauridae) is an opportunistic predator of small vertebrates (e.g., fishes, frogs, and tadpoles; Azevedo and Smith 2004. *In* Borges et al. [eds.], Janelas para Biodiversidade no Parque Nacional do Jaú, pp. 135–142. Fundação Vitória Amazônica, Manaus; Menin et al. 2005. Phyllomedusa 4:39–47). Here, we present the first report of *A. rufus* preying on the gymnophthalmid lizard *Arthrosaura reticulata*.

The observation occurred at 1430 h on 12 December 2002 at Reserve Adolpho Ducke, in the municipality of Manaus, State of Amazonas, Brazil (02°54'S, 59°53'W, datum: WGS 84; elev. 78 m). We encountered an adult male *A. rufus* (32.9 mm TL) in terra-firme forest, motionless and camouflaged in the leaf-litter, capturing a young male *A. reticulata* (37.8 mm SVL) that passed nearby. The spider secured the body of the lizard with its chelicerae, whereupon the lizard immediately autotomized its tail. While we attempted to collect the spider, it released the lizard. The lizard survived, remaining motionless, for ca. 4 min before succumbing to the effects of the spider's venom. These two species occur in similar habitats near bodies of water (Avila-Pires 1995. Zool. Verh. Leider. 299:1–706; Höfer and Brescovit 2000. Insect Syst. Evol. 31:323–360), which may facilitate this occasional intraguild predation.

The *A. reticulata* (INPA-H 16058) and the *A. rufus* were deposited in the herpetological and invertebrate collections, respectively, of the Instituto Nacional de Pesquisas da Amazônia. T. R. Gasnier verified the identity of the *A. rufus*.

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ASPIDOSCELIS LINEATISSIMUS (Colima Whiptail Lizard). **PREDATION.** *Aspidoscelis lineatissimus* inhabits Tropical Dry Forest in Pacific Mexico from Nayarit to Guerrero (García and Ceballos 1994. Fundación Ecológica de Cuixmala-Instituto de de Biología UNAM, México; Smith and Taylor 1950. Bull. U.S. Natl. Mus. 199:1–253). The Mexican government regards this species as requiring special protection, a criterion established under the authority of the Secretaria de Recursos Naturales y Medio Ambiente (NOM-SEMARNAT-059-2001). Several investigators have studied *A. lineatissimus* (Walter 1970. Herpetologica 26:359–365; Ramirez-Bautista and Uribe-Peña 1989. Herpetol. Rev. 20:70; Ramirez-Bautista 1994. Manual y Claves Ilustradas de los Anfibios y Reptiles de la Region de Chamela, Jalisco. Tesis Doctoral, Facultad de Ciencias, Universidad Nacional Autonoma de México; Ramirez-Bautista et al. 2000. Copeia 2000:712–722), but data on predators are lacking. Hence, we report an observation of *Salvadora mexicana* predation on *A. lineatissimus* from coastal Jalisco, México.

During a herpetofaunal survey on 16 October 2004, we photographed an adult (85 cm SVL) male *S. mexicana* consuming an adult (ca. 16 cm SVL) male *A. lineatissimus* in the municipality of La Huerta, 65 km N of Barra de Navidad (19°31'24.2"N, 105°02'11.7"W, datum: NAD 27; elev. 47 m). The snake was not collected. SG made the observation near the margin of the Chamela River; dominant riparian vegetation included *Crescentia alata*, *Astianthus viminalis*, *Tabebuia chrysantha*, *Coccoloba* sp., *Lonchocarpus* sp., and *Thouinidium decandrum*. Tropical Deciduous Forest dominates upland vegetation in the area (Lott 2002. *In* Noguera et al. [eds.], Historia Natural de Chamela, pp. 99–136. Instituto de Biología, Universidad Nacional Autonoma de Mexico, Ciudad de Mexico; Raymundo Ramírez-Delgadillo, pers. comm.). When first observed, the snake had already begun feeding on the lizard, which was being ingested headfirst. When about 40% of the lizard had been ingested, the snake released the lizard, presumably to better reposition it to continue swallowing. Ultimately, the snake swallowed the lizard; the feeding sequence we were able to observe took ca. 25 min.

Salvadora mexicana, which occurs in several vegetation associations along the Pacific Coast of Mexico from Nayarit to Oaxaca (Garcia and Ceballos, *op. cit.*), has a diet that is incompletely understood, but Bogert (1939. Publ. Univ. California Los Angeles Biol. Sci. 1:177–236) reported that a *S. mexicana* secured by Walter Mosauer at Tierra Colorada (Guerrero) had eaten an adult *Cnemidophorus* (= *Aspidoscelis*) *guttatus*. Moreover, other species of *Salvadora* are known to eat whiptails and racerunners (Coues 1875. Rept. Geog. Geol. Expl. Surv. West 100th Meridian 5:585-633; Bogert, *op. cit.*), which likely reflects a pattern in the genus.

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CALEDONISCINCUS HAPLORHINUS (Strand Litter Skink). **PREDATION.** *Caledoniscincus haplorhinus* is a small skink endemic to New Caledonia that has been reported primarily from the southwest coast from Nouméa to Pindaï and Pouembout with scattered records further north. Records on the east coast are few, but this probably reflects a lack of collecting effort in the appropriate habitat in this area. This skink occurs also on most islands in the region including Ouvéa, Maré, and Lifou in the Loyalties, and on Île Surprise and the Belep Islands off the northern end of New Caledonia. It seems absent from Île Huon, the northernmost part of New Caledonia territory and from the Isle of Pines (Bauer and Sadlier 2000. The Herpetofauna of New Caledonia. Society for the Study of Amphibians and Reptiles in cooperation with the Institut de Recherche pour le Développement. 310 pp.). No data exist on its predators (Bauer and Sadlier, *op. cit.*), although other large skinks (e.g., *Lioscincus nigrofasciolatum* and *Phoboscincus garnieri*, both likely syntopic with *C. haplorhinus*) are anticipated predators. Here we report a case of predation on *C. haplorhinus* by an avian predator.

At ca. 1000 h on 28 November 2005, RLG observed and photographed an adult *Todiramphus sanctus canacorum* (Sacred Kingfisher) carrying an adult (ca. 45 mm SVL) *C. haplorhinus* in his bill (Fig. 1). This bird species was regularly seen bringing skinks to feed its chicks in a nest located in the lower part of a dead Coconut Tree (*Cocos nucifera*) along the beach. The observations took place on Islet Beautemps-Beaupré (20°24'35"S, 166°08'30"E, datum: WGS 84; elev. 5 m).

FIG. 1. Sacred Kingfisher carrying an adult *Caledoniscincus haplorhinus*.

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CNEMASPIS KENDALLII (Kendall's Rock Gecko). **PREDATION**. Myrmecophagy, consumption of ants as prey, is a common nutritional strategy among amphibians and reptiles (e.g., poison dart frogs—Caldwell 1996. J. Zool. [London] 240:75–101; desert horned lizards—Blackshear and Richerson 1999. Texas J. Sci. 51:147–152). The reverse strategy, ants actively preying on living amphibians and reptiles rather than just scavenging on their remains, is something for which we have found no evidence in the literature. We have heard anecdotes according to which groups of foraging ants, including army ants as well as other species, opportunistically attacked small frogs and lizards, and even hatching tortoises (*Testudo graeca*; Y. Werner, pers. comm.). However, to the best of our knowledge predation by a solitary ant on an amphibian or reptile has never been reported in the literature. This is not surprising since, ordinarily, amphibians and reptiles outsize ants. However, size may not limit predation by ants on lizards where giant ants exist. For this reason, we report an observation of predation by a giant ant on a gecko from Peninsular Malaysia. At ca. 1500 h on 24 July 2003, during a visual survey for reptiles and amphibians in lowland dipterocarp forest (Grismer et al. 2004. Asiatic Herpetol. Res. 10:244–276) along the Tekek-Juara Trail on Pulau Tioman, Pahang State (2°49'N, 104°10'E; elev. 125 m) a solitary individual of the Malaysian Giant Forest Ant (*Camponotus gigas*) was observed carrying an unusually large prey item in its mandibles. This species is one of the world's largest ants, reaching nearly 3 cm total body length. It is known to engage in ritual combat (Pfeiffer and Linsenmair 2001. J. Ethol. 19:75–85), and procurement of sizeable prey items is not unusual for an aggressive species such as this. Close examination of the relatively fresh, partially digested, fleshy mass revealed the prey item to be a small individual of the saxicolous gecko *Cnemaspis kendallii* (specimen collected and its identity verified by L. Lee Grismer). During our herpetological survey work in the rainforest of Pulau Tioman, we have frequently observed individuals of *C. gigas* crisscrossing the leaf litter, either as a means of surveying an area surrounding a colony or on solitary foraging excursions. During such forays, these ants cover some of the habitat used as hiding places by *C. kendallii*. We presume that the gecko captured by this ant fell victim to a chance encounter, since ordinarily a gecko would easily outrun an ant. However, a small *C. kendallii* would probably not be able to outwrestle the powerful mandibles of these ants.

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COPHOSAURUS TEXANUS (Greater Earless Lizard). **MORTALITY**. Prey selection among lizards involves decisions made during pursuit and capture that have positive consequences when food is acquired but potentially negative consequences if the intended prey presents injury-producing or life-threatening antipredator defenses (Sherbrooke 2002. Herpetol. Rev. 33:312). Hence, we document the death of a *Cophosaurus texanus* that may be the result of ingested prey.

At 1206 h on 15 May 2005 near the Indio Mountains Research Station headquarters 40 km SW of Van Horn, Hudspeth Co., Texas, USA (30°46'35"N, 105°00'55"W, datum: WGS 84; elev. 1215 m), we observed a gravid female *C. texanus* (65 mm SVL, 33 mm tail, partly regenerated) moving erratically on the floor of an arroyo within a Chihuahuan Desert scrub habitat. Despite our approach, the lizard never attempted to flee. Failure to flee was also peculiar because it was exposed to elevated midday air temperatures in full sun; ambient air temperature was estimated to be ca. 35°C, and substrate temperature undoubtedly greater. Such conditions would normally have compelled the lizard to flee a potential predator (our presence) or to find a shaded refuge. Instead, when the lizard made forward movements, which occurred several times during our observation, it would pause, close its eyes, and then slowly shift its head from side to side. The lizard died after 14 min of

FIG. 1. Female *Cophosaurus texanus* and two honeybees (*Apis mellifera*) removed from the contents of its stomach. The honeybee on the left is shown for comparison.

displaying that behavior fully exposed to unshielded sunlight. External inspection of the lizard revealed no signs of injuries, trauma to the skin, or subcutaneous bleeding, so we assumed that its death was probably not the result of predator attack.

Necropsy confirmed lack of physical trauma to the lizard, and inspection of its stomach revealed that it had recently fed on the following undigested insect prey: one ant (Formicidae), one beetle (Coleoptera), two termites (Isoptera), two bugs (Rophalidae), one mantis (Mantidae), two sweat bees (Halictidae) and two worker honeybees (Apidae: *Apis mellifera*; Fig. 1). Prior investigations of *C. texanus* diet (Barbault 1978. La Terre et la Vie. 32:135–150; Barbault and Maury 1981. Oecologia 51:335–342; Maury 1981. *In* Barbault and Halffter [eds.], Ecology of the Chihuahuan Desert: Organization of Some Vertebrate Communities, pp. 119–142. Publ. Instituto de Ecología, Mexico; Smith et al. 1987. Great Basin Nat. 47:175–185; Maury 1995. J. Herpetol. 29:266–272; Kasson 2001. Herpetol. Rev. 32:40) have not reported honeybees. Moreover, we initially noticed that both bee stingers were detached from their bodies, which would be the case if envenomation had occurred in a normal defensive manner (Caron 1999. Honey Bee Biology and Beekeeping. Wicwas Press, Cheshire, Connecticut. 355 pp.). One stinger was later found imbedded in the mouth lining and the other in the stomach. Hence, our observation suggests that the lizard died after being stung subsequent to ingesting the two honeybees. Whether death was directly caused by venom toxicity or alternatively by the lizard becoming disoriented and behaviorally incapacitated by the toxin, which eventually led to a fatal state of overheating, is not known.

Both the preserved lizard and its stomach contents were deposited in the Laboratory for Environmental Biology, Centennial Museum, The University of Texas at El Paso (UTEP 19226). We thank Paul Lenhart for prey item identification.

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***ENYALIUS* SP.** (NCN). **PREDATION.** Species of *Enyalius* usually use a combination of cryptic coloration and immobility to avoid predation (Pianka and Vitt 2003. Lizards: Windows to the Evolution of Diversity. University of California Press, Berkeley. 333 pp.). However, herein we describe the first predation records on an undescribed species of *Enyalius* from Brazilian cerrado by a Black-tufted-ear Marmoset (*Callithrix penicillata*).

Observations occurred on 21 September and 4 October 2005 at Jardim Botânico de Brasília, Distrito Federal, Brazil (15°51'38.15"S, 47°49'51.20"W, datum: WGS 84; elev. 1127 m), in an area of mesotrophic "cerradão" forest. In the first observation, the dominant female of a *C. penicillata* group was first observed at a height of ca. 1 m eating an *Enyalius* sp. by the head; the latter appeared to be a female based on the dorsal color pattern of paravertebral stripes. The marmoset continued eating the rest of the body while her two infants produced begging calls and attempted to reach the lizard without success. The predation event was observed for 47 min, with the female marmoset being constantly interrupted by her group mates' harassment.

In a second observation, the same dominant female was again sighted at a height of ca. 1 m eating another *Enyalius* sp. by the head. In this case, the dorsal color pattern, consisting of lozenges, did not allow sex identification. After a few attempts one of the subordinate females stole the lizard from the dominant animal, and was able to eat the remaining parts of the body, which included the hind limbs and tail. Both marmosets were observed eating the lizard for a total time of ca. 35 min.

We thank to Jardim Botânico staff for fieldwork authorization and to CAPES and CNPq for financial support.

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HEMIDACTYLUS TURCICUS (Mediterranean Gecko). **DIURNAL BURROWS; REFUGIA.** *Hemidactylus turcicus*, an introduced species found throughout the southeastern United States (Conant and Collins. 1998. Reptiles and Amphibians of Eastern/Central North America. 3rd ed., Houghton Mifflin Co., Boston, Massachusetts. 450 pp.), typically is associated with buildings and other human structures (Rose and Barbour 1968. Am. Midl. Nat. 79:159–168; Dundee and Rossman 1989. Amphibians and Reptiles of Louisiana. Louisiana State University Press, Baton Rouge. 295 pp.). Known for its arboreal habits with adults foraging higher on walls than juveniles (Gomez-Zlatar and Moulton 2005. Florida Sci. 68:206–214; Paulissen and Buchanan 1991. J. Arkansas Acad. Sci. 45:81–83), information on its terrestrial behavior is limited. Hence, we describe an observation of a group of *H. turcicus* occupying a rock pile in the Liberty Eylau region of Texarkana (33°20.066'N, 94°05.189'W, datum: NAD 27; elev. 162 m), Bowie Co., Texas, USA.

At ca. 1600 h on 3 May 2006, we were moving a large pile of flagstone located in a overgrown rock garden on a 2-ha field situated in a rural-urban interface. Immediately to the south are ca. 518 ha of grazed grassland and forest abutting the Sulfur River. Immediately to the north is a residential area composed of lots from 0.1 to 1.21 ha. The rocks were scattered no more than four stones deep and located ca. 25 m from the nearest building. The pile encompassed an area of ca. 5 × 3 m and was overgrown with native and introduced vegetation including Day Lilies (*Hemerocallis* sp.), Evening Primrose (*Oenothera lamarckiana*), Pink Wood Sorrel (*Oxalis regneli*), and various grasses.

The rocks were removed one at a time and piled into a cart. The first *H. turcicus* was observed under a large (ca. 1 m) diameter flagstone stacked on top of several smaller (ca. 30 cm) flagstones. We continued to remove stones and observed four more *H. turcicus* prior to removing all but the rocks in direct contact with the ground. Of the 12 similarly sized rocks (ca. 30 cm each) located on the ground, three harbored *H. turcicus* in what appeared to be burrows. All *H. turcicus* appeared to be adults (ca. 50–60 mm SVL). The first burrow was linear and tube-shaped (139 mm × 20 mm) with an entrance positioned at the edge of the flagstone, under which the burrow was located. The second burrow was also tube-shaped but had a 90° bend located 100 mm from the entrance (also positioned at the edge of the respective piece of flagstone) creating an L-shaped tube (131 mm × 17.2 mm). In both burrows, the rock formed the burrow roof under which it was constructed. The sides and base of the burrows were composed of a sandy loam typical of Bowie Co. A third *H. turcicus* was observed in a refugium under a rock, but this refugium did not have the tube structure of the other burrows. This third refugium was dish-shaped and ca. 60 mm in diameter. It was unclear whether this structure was a burrow or simply a space that the *H. turcicus* chose to occupy. Upon removal of the rocks, no *H. turcicus* were observed in the immediate vicinity of the original rock garden where they were released or in the cart where the rocks had been deposited through 11 May 2006. This final observation suggests these animals abandon their burrows if disturbed.

This cluster of observations suggests that *H. turcicus* is not restricted to buildings, and may even be more abundant in other kinds of habitats near human dwellings. These observations suggest that positioning rock gardens near homes can provide important habitat for this species. Further, removal of or aversion to providing such potential habitat may be an important tool for removal or suppression of populations of this introduced invasive species.

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HEMIDACTYLUS TURCICUS (Mediterranean Gecko). **PREY; PREDATION.** Invasive species are becoming an increasingly important consideration for conservation, but how invasive species interact with one another remains poorly understood. We contribute to that understanding with an observation of *Hemidactylus turcicus* predation on the Red Fire Ant (*Solenopsis invicta*) immediately followed by fire ant predation on the same animal.

Hemidactylus turcicus is a small insectivorous gecko widely distributed by human activities (Wojcik et al. 2001. Am. Entomol. 47:16–23), common throughout the mid-southern United States. The Red Fire Ant, the most widely distributed of two *Solenopsis* species introduced in the United States (http://ipmworld.umn.edu/chapters/lockley.htm, last visited on 11 May 2006), is thought to be in competition with the regional herpetofauna for various prey (Wojcik et al., *op. cit.*; Hook and Porter 1990. Southwest. Nat. 35:477–478). Documentation also exists for *S. invicta* predation on snakes (Wojcik et al., *op. cit.*), *Bufo houstonensis* (Wojcik et al., *op. cit.*), turtles (Buhlmann and Coffman 2001. J. Elisha Mitchell Sci. Soc. 117:94–100; Moulis 1997. Chelonian Conserv. Biol. 2:433–436; Montgomery 1996. Bull. Chicago Herpetol. Soc. 31:105–106), *Aspidoscelis sexlineatus* nests (Mount et al. 1981. J. Alabama Acad. Sci. 52:66–70; Donaldson et al. 1994. Texas J. Sci. 46:98–113), and large segments of a local herpetofauna (Mount 1981. J. Alabama Acad. Sci. 52:71–78). Aggression by *S. invicta* has also been reported on *Alligator mississippiensis* (Allen et al. 1997. J. Herpetol. 31:318–321; Reagan et al. 2000. J Herpetol. 34:475–478), *Caretta caretta* (Allen et al. 2001. Florida Entomol. 84:250–253), and *Gopherus polyphemus* (Wetterer and Moore 2005. Florida Entomol. 88:349–354). These observations indicate that *S. invicta* can be an aggressive herpetovore.

At ca. 2300 h on 2 August 2005, a juvenile (ca. 30 mm SVL) *H. turcicus* was foraging on fire ants on our back porch (33°20.066'N, 94°05.189'W, datum: NAD 27, elev. 162 m) in Bowie Co., Texas, USA. I observed the animal feed on 6–7 ants and then left. Upon returning 20 min later, I found the animal engulfed in ants. By 0750 h the next morning, the *H. turcicus* was skeletonized. I collected the skull (length 12.2 mm, width 7.8 mm, height 4.9 mm) and deposited it in my private research/teaching collection (MLM 1).

This observation suggests that interspecific predator-prey dynamics exist between sympatric populations of *H. turcicus* and *S. invicta*.

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HOLBROOKIA MACULATA (Earless Lizard). **NECROPHILIA.** To our knowledge, reports of mating or attempted mating with a dead conspecific or heterospecific individual among squamates are confined to only three species: the Australian skink, *Tiliqua rugosa* (How and Bull 1998. Herpetol. Rev. 29:240), the Brazilian snake, *Tachymenis brasiliensis* (Amaral 1932. Mem. Int. Butantan 7:91–94), and the Long-nosed Leopard Lizard, *Gambelia wislizenii* (Fallahpour 2005. Herpetol. Rev. 36:177–178). Here, we report an observation of this behavior in *Holbrookia maculata* from northwest Texas, USA.

A large population of *H. maculata* exists on the edges of the roads in Rita Blanca National Grassland in extreme northern Texas. We studied this population while conducting research on the thermal regimes of this and several other lizard species of similar size. We recorded surface temperatures on the roads as high as 46°C, while surface temperatures of the bordering grasses were 27°C. These conditions offer a wide thermal gradient in which to function, an advantage that may attract this *H. maculata* population to the road margins.

On 14 June 2005 at 1730 h, a male *H. maculata* living along State Highway 296 (36°26.831'N, 102°44.454'W, datum: WGS 84; elev. 1307 m) was observed copulating with a dead conspecific female. The female had been spotted the previous day dead on the side of the road. Apparently, she had been partially run over by a car on 13 June, although her injuries were not extensive and her body, although moderately desiccated, was still intact. Her eyes were sunken and she was unequivocally dead. The male was observed grasping the female by the back of the neck and dragging her in short 1–2 cm jerks across the asphalt. His tail was raised and his right hemipenis appeared to be everted, although it was not clear if copulation was actually successful. This behavior persisted for at least 3–4 minutes but ceased when the researchers approached. A second male *H. maculata* was sighted ca. 0.5 m away. The second male appeared to be observing the attempted copulation and possibly had mated or was waiting to mate with the deceased female.

H. maculata breed in the spring and produce 1–2 clutches per season, depending on the age of the female (Jones and Ballinger 1987. Ecology 68:1828–1838). During the breeding season, females vary their coloration to signal courtship receptiveness or rejection, having low-intensity color early in the season and high-intensity pigmentation late in the season once they have mated (Hager 2001. J. Herpetol. 35:624–632). The behavior reported here implies that the coloration of this immobile female was adequate to induce attempted copulation.

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LIOLAEMUS cf. ELONGATUS (NCN). **BODY TEMPERATURE.** *Liolaemus cf. elongatus* inhabits the east slope of the Andean Cordillera in central-western Argentina (Morando et al. 2003. Syst. Biol. 52:159–185). Based on molecular evidence, this taxon, for which formal description is pending, is part of the "*petrophilus* group" clade within the *Liolaemus elongatus-kriegi* complex (Avila et al. 2004. Herpetologica 60:187–203). Its biology has not been addressed. Hence, here we present preliminary data on *L. cf. elongatus* thermal ecology.

In December 2004 and February 2005, we conducted field work in the Parque Nacional San Guillermo, Departamento Iglesia, Provincia de San Juan (29°15'S, 69°29'W, datum: WGS 84; elev. 3700 m), located in the Puna Phytogeographic Province. *Stipa speciosa var. breviglumis, Lyciun chanar,* and *Adesmia* spp. dominate the largely Andean flora (Cabrera and Willink 1980. Biogeografía de América Latina. Washington, D.C. 109 pp.). The data presented are based on 16 captures. To collect these data, we revisited a randomized selection of bushes and low rocks across the study site. Each individual was captured by hand, and its SVL was measured to the nearest 0.05 mm. Sex was not determined in the field because obvious sexual dimorphism was lacking. For each capture, cloacal (T_c), substrate (T_s) and air (T_a) temperatures were measured to nearest 0.1°C with a rapid-reading Miller-Weber thermometer. We took T_s at the exact point of observation, and T_a 1 cm above the substrate, both immediately following capture. We also recorded microhabitat type for each capture.

Of 26 individuals observed, 16 were captured. Mean SVL was 59.8 mm (SD = 9.5, range: 41–72, N = 15). Mean body temperature of the 16 *L. cf elongatus* was 32.0°C (SD = 2.5°C, range = 28.0–36.6°C). Mean air temperature was 29.3°C (SD = 5.6°C, range = 21.0–41.6°C). Mean substrate temperature was 35.4°C

(SD = 11.1°C, range: 22.0–57.0°C). Body size was unrelated to T_c (Spearman Rank Correlation: $r_s = -0.05$, $P = 0.84$, N = 15). Cloacal temperature and T_a were significantly correlated (Spearman Rank correlation: $r_s = 0.69$, $P = 0.002$), but T_c and T_s were not (Spearman Rank correlation: $r_s = 0.43$, $P = 0.09$). Most lizards were found on rocks (N = 16), the remainder being found under vegetation (7), on vegetation (2) or in burrows (1).

Based on the correlations among T_c, T_s, and T_a, *Liolaemus cf elongatus* seems heliothermic, similar to *L. wiegmanni* (Martori et al. 1998. Rev. Esp. Herpetol. 12:19–26) and *L. sanjuanensis* (Acosta et al. 2004. Herpetol. Rev. 35:171). In contrast, body temperature in *Liolaemus elongatus* was positively and significantly correlated with both T_a and T_s (Ibargüengoytía and Cussac 2002. Herpetol. J. 12:131–134). This species thermoregulates over a narrow range of temperature by moving among microhabitats having different temperature, i.e., basking and shuttling behavior.

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LIOLAEMUS LUTZAE **(Sand Lizard). PREDATION.** The liolaemid lizard *Liolaemus lutzae* is endemic to the "restingas" (coastal sand dune habitats) of the State of Rio de Janeiro, southeastern Brazil (Vanzolini and Ab'Saber 1968. Pap. Avuls. Zool. São Paulo 21:205–208) and is included in the Brazilian checklist of the fauna threatened with extinction as critically endangered (Machado et al. 2005. Lista da Fauna Brasileira Ameaçada de Extinção. Fundação Biodiversitas, Belo Horizonte. 157 pp.). Information regarding *L. lutzae* predators is restricted to a few records of interspecific predation (e.g., the birds *Guira guira* and *Athene cunicularia* and the ghost crab *Ocypode quadrata*) and cannibalism (Rocha 1992. Herpetol. Rev. 23:60; Rocha and Vrcibradic 1998. Cienc. Cult. 50:364–368). Here we report predation of *L. lutzae* by the snake *Philodryas patagoniensis* (Colubridae). This snake is very common in restinga habitats and is known to prey on lizards in this environment (Rocha and Vrcibradic, *op. cit.*).

At 1035 h on 23 April 2006, during population monitoring of *L. lutzae* on the sand beach habitat at the restinga of Jaconé (22°56'S, 42°40'W, datum: WGS 84; elev. 2 m), municipality of Saquarema, Rio de Janeiro, we found, under a piece of wood, a young female *P. patagoniensis* (267 mm SVL, 371 mm total length, 15.2 g) with a considerably expanded abdomen, suggesting recent prey ingestion. At the same place there was a live *Liolaemus lutzae*, which promptly escaped. We collected the snake, and posterior dissection revealed that it had ingested a juvenile male *L. lutzae* (54.5 mm SVL, 5.2 g) headfirst. The lizard was undigested, implying a recent ingestion. This is the first record of *L. lutzae* as prey of *P. patagoniensis*, which constitutes an additional source of mortality for this endangered lizard.

The snake and its prey were deposited at the reptile collection of the Museu Nacional do Rio de Janeiro, Universidade Federal do Rio de Janeiro (MNRJ 14122). Mara C. Kiefer and Davor Vrcibradic provided suggestions on the manuscript. Fundação Biodiversitas/CEPAN (Project 078H/022004) and CNPq provided funding (Processes # 307653/03 and 477981/03), and CCS received a graduate fellowship from FAPERJ.

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LIOLAEMUS OLONGASTA **(NCN). REPRODUCTION.** *Liolaemus olongasta* is an oviparous lizard inhabiting the hot arid landscape of the Monte Phytogeographic Province in northern Argentina (Cabrera and Willink 1980. Biogeografía de América Latina. Washington, DC. 109 pp.). Known from extreme western La Rioja Province and San Juan Province at 900–1600 m elevation (Etheridge 1993. Museo Regionale di Scienze Naturali 11:1–199), data on its biology are sparse. Limited study has been devoted to thermoregulation, sexual dimorphism, and time budgets (Cánovas et al. 2001. Congreso Argentina Herpetol. IV:32–33; Cánovas et al. 2002. Reunión de Com. Herpetol. Asoc. Herpetol. Argentina XVI:45; Cánovas et al. 2003. Reunión de Com. Herpetol. Asoc. Herpetol. Argentina. XVII:38). Hence, we add the first data addressing *L. olongasta* reproductive ecology.

We conducted fieldwork in a temporary creekbed near La Laja (31°19'S, 68°41'W, datum: WGS 84; elev. 700 m) Albardón Department, San Juan Province, Argentina. Data were collected every 10 days from August 2000 to August 2001 by a random pattern of revisits across the study site. Each animal was measured (SVL) and dissected for gonadal examination. In females, we recorded the number of developing follicles and oviductal eggs, the length and width of oviductal eggs, and the condition of the oviducts. In males, we recorded the width and length of testes to enable calculation of volume based on Dunham (1983. *In* Huey et al. [eds.], Lizard Ecology, pp. 261–280. Harvard Univ. Press, Cambridge, Massachusetts). Testicular volume and volume of eggs were natural log-transformed to accommodate their curvilinear functions (King 2000. J. Herpetol. 34:148–150.). Clutch size was determined from the combined number of developing follicles and eggs in the oviducts. We used the simultaneous presence of developing follicles and enlarged oviducts to suggest that more than one clutch was produced seasonally. The smallest female with vitellogenic follicles or oviductal eggs was used to estimate SVL at maturity. Males were considered sexually mature if they contained enlarged epididymides. All measurements were obtained to the nearest 0.02 mm with Vernier calipers.

Forty-three females ranged in size from 23–58 mm SVL; minimum reproductive size was 47 mm. Female body size was correlated with clutch size (Spearman: $r_s = 0.64$, $P = 0.045$, N = 10). Clutch size averaged 3.8 (SD = 1.93, range 1–8, N = 10). Between September and October, we recorded four females with developing follicles and enlarged oviducts simultaneously.

Forty-one males ranged in size from 32–62 mm SVL, minimum reproductive size was 49 mm. Testicular volume was positively correlated with body size ($r^2 = 0.31$, $F_{1,39} = 17.81$, $P = 0.0001$, N = 41). Testicular volume varied through the gonadal cycle

(ANCOVA: $F_{9,30} = 6.5$; $P = 0.0001$; N = 41; covariate SVL). Maximum testicular volume occurred in November; the minimum was found in March.

Our data indicate that *L. olongasta* produces more than one clutch a year, as is the case with *L. darwinii* (Blanco et al. 2001. Congreso Argentina Herpetol. IV:26–27), *L. koslowskyi* (Aun et al. 1993. Cuad. Herpetol. 12:1–9), and *L. wiegmanni* (Vega 1999. Ecología de saurios arenícolas de las dunas costeras bonaerenses. Tesis doctoral, inédita, Universidad Nacional de Mar del Plata. 102 pp.). Mean clutch size of *L. olongasta* is similar to that for *L. darwinii* (mean 4.9, range 2–8, N = 40), *L. riojanus* (mean 4.2, range 3–6, N = 15) (Blanco et al. 2001., *op. cit.*; Blanco et al. 2003. Reunión de Com. Herpetol. Asoc. Herpetol. Argentina. XVII:31), *L. koslowskyi* (mean 4.2, range 3–9, N = 53) (Aun et al., *op. cit.*), *L. wiegmanni* (mean 4.6, range 4–5, N = 19), *L. multimaculatus* (mean 4.2, range 3–7, N = 29), *L. gracilis* (mean 4.7, range 4–6, N = 19) (Vega, *op. cit.*), and *L. sanjuanensis* (mean 4.5, range 3–6, N = 5; Marinero et al. 2005. Herpetol. Rev. 36:452). Reproductive activity in this species is spring–summer.

All specimens (IMCN-UNSJ 4015–4099) were deposited in the herpetology collections of Instituto y Museo de Ciencias Naturales of Universidad Nacional de San Juan.

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LIOLAEMUS PETROPHILUS (Stone-loving Lizard). **SCOLIOSIS.** Scoliosis and other malformations of the vertebral column like kyphosis are well known in turtles (Rhodin et al. 1984. Brit. J. Herpetol. 6:369–373; Stuart 1996. Bull. Chicago Herpetol. Soc. 31:60–61) and captive iguanas (Otero Llende and Bengoa Rodríguez 2001. Res. VII Congr. Anual Soc. Española Med. Veterinaria, pp. 24–30), but infrequently reported in wild populations of lizards (Mitchell and George 2005. Herpetol. Rev. 36:183–184). Most malformations reported for lizards include bifurcations of the tail, usually as a result of injuries (Scott 1982. Herpetol. Rev. 13:46, Smith 1946. Handbook of Lizards. Cornell Univ. Press, Ithaca, New York. 557 pp.). Here we provide the first report of scoliosis in a liolaemid lizard.

On February 2006, we caught an adult male *Liolaemus petrophilus* (75 mm SVL) on basaltic formations located 31.4 km N Gan Gan, Departamento de Telsen, Chubut (42°22'57.9"S, 68°10'45.4"W, datum: WGS 84; elev. 1246 m). The lizard exhibited a deformation over the pelvic girdle (Fig. 1). This lizard appeared to experience no obvious limitations in prey capture or mobility as it was maintained in captivity several weeks for thermoregulation experiments.

Voucher specimen (LJAMM 3817) is deposited in collection Luciano Javier Avila Mariana Morando (LJAMM) now housed in Centro Nacional Patagónico (CENPAT-CONICET), Puerto Madryn, Argentina.

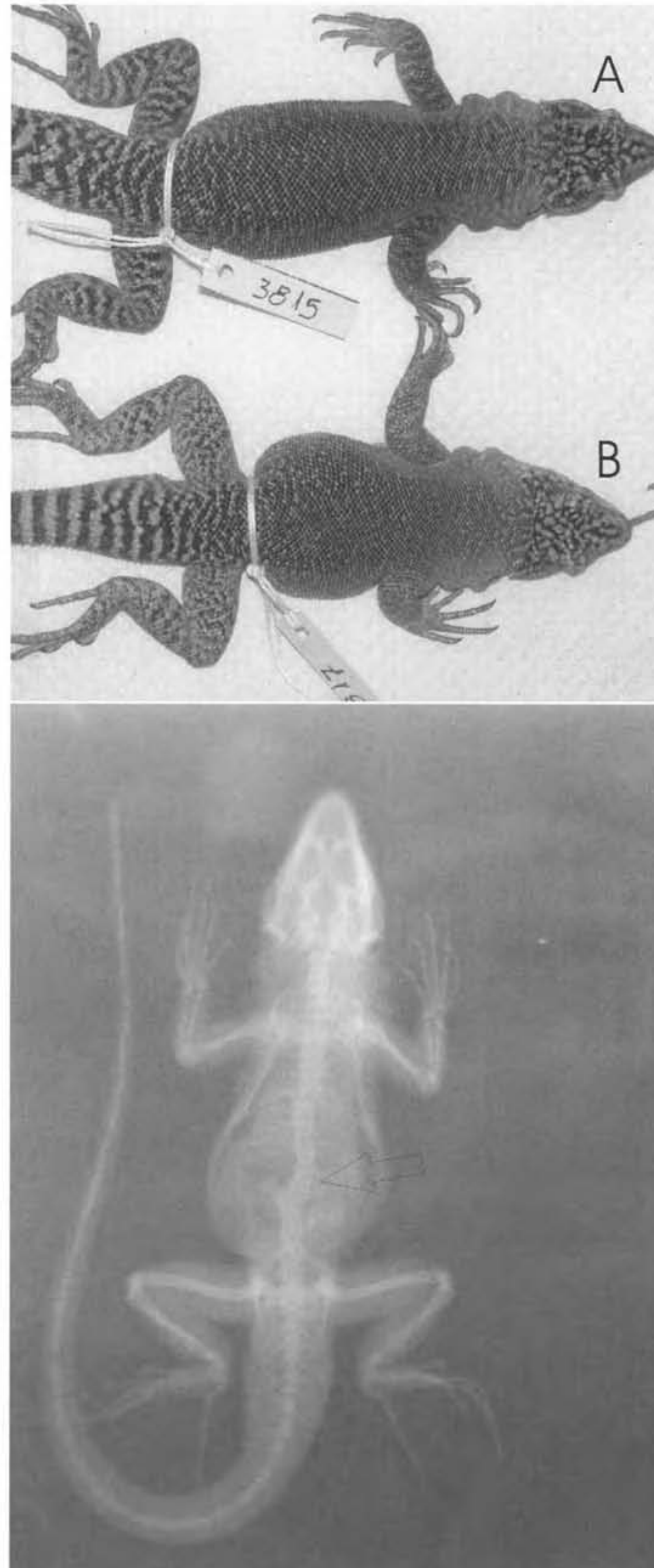

FIG. 1. Upper: Normal (A) and scoliotic (B) male *Liolaemus petrophilus*. Lower: Radiograph of the scoliotic individual; arrow indicates the area of deformity.

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LIOLAEMUS USPALLATENSIS (NCN). **CLUTCH SIZE.** *Liolaemus uspallatenisis*, a small lizard in the "*darwinii* complex" (Etheridge 1993. Boll. Mus. Reg. Nat. Sci., Torino 11:137–199), is distributed in Mendoza and San Juan provinces, Argentina. This species occurs in rocky, high-elevation habitats dominated by xerophyllous vegetation (*Larrea cuneifolia*, *Lycium* sp., and *Stipa* sp.). Other than it being oviparous, no reproductive data exist (Cei 1986. Reptiles del Centro, Centro-oeste y Sur de la Argentina. Herpetofauna de Zonas Áridas y Semiáridas. Museo Regionale di Scienze Naturali Torino. Monografie IV. 527 pp.). Hence, we report the first data on clutch size in *L. uspallatensis*.

On 17 December 2005, we captured a gravid female (58 mm SVL) *L. uspallatensis* at Barrealito Blanco, Iglesia Department, San Juan Province (30°30'S, 69°10'W, datum: WGS84; elev. 2519 m). This female was placed in a 60 × 50 × 40 cm terrarium with abundant leaves and gravel. On 24 December 2005, the female laid three eggs. The length and width of each egg were measured with Vernier calipers to the nearest 0.01 mm. The volume of each egg was calculated using the formula of an ellipsoid sphere (Dunham 1983. *In* Huey et al. [eds.], Lizard Ecology, pp. 261–280. Harvard University Press, Cambridge, Massachusetts). The eggs averaged 1.37 cm (s = 0.46) in length, 0.77 cm (s = 0.46) in width, and 0.24 cm^3 (s = 0.02) in volume. Clutch size may typically be small in this species as another female *L. uspallatensis* that had been trapped also produced three eggs (JCA, unpubl. data).

The eggs were deposited in the herpetological collection of the Institute and Museum of Natural Sciences of San Juan National University, San Juan, Argentina. We thank Eduardo Sanabria for capturing this specimen.

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MABUYA UNIMARGINATA (Central American Mabuya). **REPRODUCTION.** *Mabuya unimarginata* are live bearers with a litter size of 4–9 born in June–July (Lee 1996. The Amphibians and Reptiles of the Yucatán Peninsula. Cornell University Press, Ithaca, New York. 500 pp.). Here I report an observation that might indicate a broader birth interval.

At 1135 h on 25 April 2004, I captured an adult female (82 mm SVL, 12.4 mm tail, 12 g) *M. unimarginata* with six totally formed young (mean SVL = 32 mm). The skink was found near of a temporary pond surrounded by tropical deciduous forest, ca. 4 km SW from Ejido Caobas, Quintana Roo, México (18°26'04"N, 89°07'06"W, datum: NAD 27), elev. 150 m.

Based on their size, the unborn young were a few millimeters smaller than the known size of *M. unimarginata* neonates (ca. 35 mm; Savage 2002. The Amphibians and Reptiles of Costa Rica: A Herpetofauna Between Two Continents, Between Two Seas. The University of Chicao Press. 934 pp.). This implies parturition during the month of May in Quintana Roo.

Oscar Flores-Villela verified the species identification. The skinks (ECO-CH-H 2542–2548) are deposited in the Colegio de la Frontera Sur (ECOSUR), Chetumal, Quintana Roo, Mexico.

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OPHIODES STRIATUS (Glass Snake). **REPRODUCTION.** Few ecological data exist on the South American anguid *Ophiodes striatus* (Borges-Martins 1998. Taxonomic Review and Phylogenetic Systematics of the Genus *Ophiodes* Wagler, 1828. Ph.D. dissertation, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil. 239 pp.), and data on reproduction are lacking. Hence, we provide data on clutch size and reproductive mode for *O. striatus* from southwestern Brazil.

At 1800 h on 23 October 2003, an adult (186 mm SVL) female *O. striatus* was collected on the campus of the Universidade Federal de Ouro Preto, Ouro Preto, Minas Gerais (20°23'S, 43°30'W; datum: WGS 84; elev. 1350 m). This area has an old bauxite mine, is currently the focus of much human activity, and has vegetation composed predominantly of exotic species as *Pinus sylvestris* and *Eucalyptus* sp. Mean annual rainfall is 2000 mm. The female *O. striatus* was in the late stages of gestation and contained 14 near-parturition, unshelled embryos (Fig. 1). Hemipenal eversion of the embryos revealed that all were males. The embryos were 46 ± 2.8 mm SVL (0.644 ± 0.02 g). This record confirms the viviparity postulated for the genus *Ophiodes* (see Leitão 1973. Ihéringia,

FIG. 1. Late-term embryo of *Ophiodes striatus*, removed from an adult female collected in Minas Gerais, southwestern Brazil.

Sér. Zool., Porto Alegre 42:34–39).

The female *O. striatus* (LZVUFOP 428S) and the embryos (LZVUFOP 432S) were deposited in the herpetological collection at Laboratório de Zoologia dos Vertebrados da Universidade Federal de Ouro Preto.

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OPHISAURUS ATTENUATUS LONGICAUDUS (Eastern Slender Glass Lizard). **REPRODUCTION**. Data regarding reproduction in *Ophisaurus attenuatus* has been obtained mostly from individuals in captivity, whereas field data on reproduction is extremely sparse (Blair 1961. Southwest. Nat. 6:201; Mount 1975. The Reptiles and Amphibians of Alabama. University of Alabama Press, Tuscaloosa, Alabama. 347 pp.; Trauth 1984. Southwest. Nat. 29:271–275; Fitch 1989. Occ. Pap. Mus. Nat. Hist. Univ. Kansas 125:1–50; Gerald 2005. Herpetol. Rev. 36:181–182). Moreover, although some information on habitat use by *O. a. attenuatus* exists (e.g., Force 1930. Copeia 1930:25–39; Clarke 1956. Trans. Kansas Acad. Sci. 59:213–219; Fitch, *op. cit.*), little is known about habitat use in *O. a. longicaudus*, especially for oviposition. Hence, here we augment the sparse data on reproduction and habitat important for nesting in *O. a. longicaudus* from central Tennessee, USA.

On 28 June 2005, we encountered an adult female *O. a. longicaudus* coiled around five eggs within a depression under a wooden board that was part of a coverboard array located on Arnold Air Force Base, Franklin Co. (35°20'51"N, 86°09'25"W, datum: NAD 83; elev. 335 m). Habitat consisted of an open Loblolly Pine (*Pinus taeda*) stand containing abundant 1-m tall grasses. This observation occurred ca. 10 m from a similar observation of a female glass lizard brooding eight eggs under a similar wood board in the same array of cover objects ca. 1 year earlier (2 July 2004; Gerald, *op. cit.*). While three of the eggs seemed healthy, two appeared non-viable because the shells were yellow in color, translucent, and slightly sunken in. The female (ca. 70 cm total length) was individually marked with a Passive Integrative Transponder (PIT) tag and subsequently released next to the nest. On 30 June 2005, the same female was observed coiled around the same clutch of eggs. On 8 July 2005, the female was observed coiled around only two eggs, which appeared healthy, averaging 2.55 cm in length and 1.65 cm in width (the eggs were not manipulated to minimize disturbance). One last observation of the female with the still apparently viable eggs was made on 11 July 2005.

The clutch size matches the smallest reported for *O. a. longicaudus* by Fitch (*op. cit.*) and Mount (*op. cit.*) in Kansas and Alabama, respectively. Reduction in egg number between observations may result from egg consumption by the female (see Fitch, *op. cit.*). The continuation of brooding following PIT tag marking suggests that this degree of handling and mode of marking may have little effect on *Ophisaurus* reproductive behavior. These observations, along with those made by Gerald (*op. cit.*), also suggest that open habitats containing tall grasses may be important for *O. a. longicaudus* reproduction. Additionally, use of cover objects for nesting in two subsequent years may indicate that this method might prove useful to assess reproductive behavior in this species.

We thank Michael Briggs, Jacob Briggs, and Joshua Briggs for assistance in the field.

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PODARCIS BOCAGEI (Bocage's Wall Lizard). **ABNORMAL SCALATION**. Abnormalities in scalation are common in lizards. Bilateral asymmetries are frequent (Dosselman et al. 1998. Herpetologica 54:434–447), as are supernumerary scales. Factors possibly responsible for such developmental anomalies are inbreeding and environmental stress (Braña and Ji 2000. J. Exp. Zool. 286:422–433; Crnobrnja-Isailovic et al. 2005. Amphibia-Reptilia 26:149–158). Here, we report a case of supernumerary femoral pores in a lacertid from northern Portugal.

During an extensive morphological study of Iberian *Podarcis*, an adult female *P. bocagei* (51.34 mm SVL) with an extra row of femoral pores was collected in Gião, coastal northern Portugal (41°18.777'N, 8°41.498'W, datum WGS 84, elev. 140 m). This locality is in the center of the species' distribution, which occupies areas of Atlantic climate on the northwestern Iberian Peninsula (Galán 2003. *In* Carrascal and Salvador [eds.], Enciclopedia Virtual de los Vertebrados Españoles. MNCN-CSIC, Madrid. http://www.vertebradosibericos.org/). Habitat consisted of agricultural fields separated by traditional granite walls, which the lizards use as refuges and in which they achieve high densities. Accessory rows of femoral pores were noted in both hind limbs (Fig. 1). The accessory pores (left $N = 9$, right $N = 7$) were smaller and located parallel, in a central position and posterior to the normal series (left $N = 20$, right $N = 20$). No other anomalies were found in this animal, which was measured, photographed and released at its site of capture. Examination of another 37 adults (21 males and 16 females) from the same population and 380 individuals from seven other localities across the species' range failed to reveal extra rows of femoral pores. In all the populations studied, males had significantly more femoral pores than females (t-test: $P < 0.05$ in all cases). Notably, the anomalous female had a particularly high number of pores; 20 was the maximum observed among *P. bocagei* we examined and occurred in only 2.8% of individuals (including but one female from a different locality and 10 males from various sites).

Walker (1980. J. Herpetol. 14:417–418) reported accessory femoral pores in the Collared Lizard, *Crotaphytus collaris*. However, in that case a substantial proportion of the adult population (63.7% of males, 36.3% of females) displayed the anomaly. This result, together with the fact that the population was small and isolated, led the author to invoke inbreeding rather than environmental stress to explain the phenomenon. In our case, the population is completely connected to others, and recent studies at this

FIG. 1. Female specimen of *Podarcis bocagei* from Gião, NW Portugal. The white arrows on each side delimit the additional row of femoral pores.

site have revealed no evidence of decreases in genetic diversity (Pinho et al. 2003. Biochem. Genet. 41:343–359; Pinho et al. 2006. Mol. Phylogenet. Evol. 38:266–273). The anomalous individual may simply be a local variant, but it may also be linked to unrecognized developmental stress as pesticides are commonly used to grow corn locally (pers. obs.). Other cases of supernumerary femoral pores have been reported among iguanians (e.g., *Sauromalus obesus*: Tanner and Avery 1964. Herpetologica 20:38–42), but to our knowledge, this is the first such report in lacertids.

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PRISTIDATYLUS SCAPULATUS (NCN). **BODY TEMPERATURE.** *Pristidactylus scapulatus* inhabits the east slope of the Andean Cordillera from north of San Juan in San Guillermo Provincial Reserve to Chubut Province (Cei 1986. Museo Regionale di Scienze Naturali Torino. Monografie IV. Torino, Italia. 527 pp.). It has an ambiguous conservation status; it is defined as a species for which "insufficient knowledge" exists (Lavilla et al. 2000. Categorización de los Anfibios y Reptiles de la República Argentina. Asoc. Herpetol. Arg., 97 pp.). No data currently exist on the thermal biology of any of the six species of *Pristidactylus* in Argentina. Hence, here we present preliminary data on *P. scapulatus* thermal ecology.

In December 2004 and February 2005, we conducted field work in the Parque Nacional San Guillermo, Departamento Iglesia, Provincia de San Juan (29°15'S, 69°29'W, datum: WGS 84; elev. 3400 m), located in the Puna Phytogeographic Province. *Stipa speciosa* var. *breviglumis, Lyciun chanar,* and *Adesmia* spp. dominate the largely Andean flora (Cabrera and Willink 1980. Biogeografía de América Latina. Washington, D.C. 109 pp.). Here, we present data based on 10 different *P. scapulatus* observed between 0930 and 1900 h on three different days, nine of which were captured. To collect these data, we revisited a randomized selection of bushes and low rocks across the study site. Each individual was captured by hand, and its SVL was measured to the nearest 0.05 mm. For each capture, cloacal (T_c), substrate (T_s), and air (T_a) temperatures were measured to nearest 0.1°C with a rapid-reading Miller-Weber thermometer. We took T_s at the exact point of observation and T_a 1 cm above the substrate, both immediately following capture. We also recorded microhabitat type for each capture. Following processing, animals were released at the point of capture.

Mean SVL of males was 105.4 mm (SD = 5.54, range: 96–110, N = 5) and mean SVL of females was 83.5 mm (SD = 10.27, range: 70–95, N = 4). Mean body temperature of the nine *Pristidactylus scapulatus* was 27.0°C (SD = 1.8, range: 24.0–29.5°C). Mean air temperature was 26.6°C (SD = 5.6, range: 18.0–33.0°C). Mean substrate temperature was 32.4°C (SD = 8.9, range: 19–42). Body size was unrelated to T_c (Spearman Rank Correlation: $r_s = 0.17$, $P = 0.64$). Cloacal temperature and each of T_s and T_a were correlated (Spearman Rank Correlation: $r_s = 0.80$, $P = 0.008$; $r_s = 0.85$, $P = 0.002$, respectively).

At this site, *P. scapulatus* remained active 4 h per day (1000–1300 h, with maximum activity at 1100–1200 h [64% of observations]). Of the 10 animals we found, nine were under *Lyciun chanar* shrubs and one on a *L. chanar* eating its fruits. Of captured animals, 70% attempted to escape into burrows beneath *L. chanar* shrubs; the remaining 30% did not display escape behavior.

Pristidactylus scapulatus has field body temperatures similar to *P. volcanensis* but higher than *P. torcuatus* and *P. valeriae* (Labra and Vidal 2003. *In* Bozinivic [ed.], Fisiología Ecológica y Evolutiva, pp. 207–224. Univ. Católica de Chile, Santiago, Chile). Despite the small sample size, the high correlation coefficient among T_c, T_s, and T_a suggests that *P. scapulatus* is a thermoconformer. This species may maintain relatively low temperatures by restricting the activity interval and remaining in the shade of *L. chanar* shrubs.

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SCELOPORUS OCCIDENTALIS (Western Fence Lizard). **CAUDAL MOVEMENT**. Caudal movements are commonly employed by squamates and serve several purposes. Caudal luring, the use of tail movement to attract prey, is common in snakes (Heatwole and Davidson 1976. Herpetologica 32:332–336) but rare among lizards (Pernetta et al. 2005. Herpetol. Rev. 36:320–321). However, tail autotomy, common in lizards, is typically followed by caudal movements that serve to distract potential predators and aid in escape (Arnold 1988. *In* Gans and Huey [eds.], Biology of the Reptilia, pp. 236–273. Alan R. Liss, Inc., New York). Additionally, in lizards, tail lashing has been observed in *Anolis* during male-male agonistic interactions (Ortiz and Jenssen 1982. Z.

Tierpsychol. 60:227–238). Here I report caudal movements in *Sceloporus occidentalis* immediately preceding prey capture that might serve to attract or distract prey.

At 0845 h on 13 April 2006, I observed an adult (ca. 7.5 cm SVL) male *S. occidentalis* basking on a rock ca. 15 cm off of the ground at the Santa Barbara Zoological Gardens, Santa Barbara Co., California, USA (34°25'13"N, 119°39'57"W, datum: WGS 84; elev. 9.5 m). After ca. 5 min of observation, the lizard caught sight of an insect crawling through the grass and immediately moved onto the ground to within 10 cm from the insect. The lizard promptly vibrated its tail rapidly from side to side, in a display similar to defensive behaviors of many snake species, while keeping the rest of its body motionless and watching the insect. This behavior lasted for ca. 3 seconds, after which the lizard lunged at and captured the insect, immediately ceasing tail movements. After the prey was consumed, the lizard returned to the rock where it remained for the rest of the observation interval (ca. 10 min). No further caudal movements were observed.

As I only observed one individual, tail movements are unlikely to be linked to agonistic behavior. Moreover, the behavior being observed only immediately preceding prey consumption implies a link to predation. It might be coincidental that tail movements preceded prey consumption, but other aspects of the episode suggest either caudal luring or distraction. I did not see the insect moving towards the lizard's tail, as might be expected with caudal luring, but while moving its tail, the lizard's body remained motionless while its gaze was fixed on the insect. To my knowledge, this is the first account of potential caudal luring or distraction of prey in *S. occidentalis*.

I thank Paul Hampton for reviewing an earlier version of this manuscript.

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TROPIDURIDAE (Tropidurid Lizards). **DEATH-FEIGNING.** Death-feigning, also called tonic immobility or thanatosis, is an innate, anti-predator behavior that arose independently in several animal lineages, including coleopteran insects (e.g., Acheampong and Mitchell 1997. Entomol. Exp. Appl. 82:83–89; Miyatake 2001. J. Insect Behav. 14:421–432), amphibians (e.g., Gargaglioni et al. 2001. Physiol. Behav. 72:297–303; McCallum et al. 2003. Herpetol. Rev. 34:54–55), snakes (e.g., Burghardt and Greene 1988. Anim. Behav. 36:1842–1844; Rugiero 1999. Amphibia-Reptilia 20:438–440), birds (e.g., Rovee-Collier et al. 1993. Physiol. Behav. 53:353–359; Sargeant and Eberhardt 1975. Am. Midl. Nat. 94:108–119), and mammals (e.g., Leite-Panissi et al. 2003. Brain Res. Bull. 60:167–178). In the actinopterygian fishes *Mycteroperca acutirostris* (Serranidae) and *Haplochromis livingstoni* (Cichlidae) death-feigning is also a hunting behavior (Gibran 2004. Copeia 2004:403–405; McKaye 1981. Environ. Biol. Fish. 6:361–365). In squamates, death-feigning is a widespread defensive tactic that is described from several different families, such as Anelytropsidae (Torres-Cervantes et al. 2004. Herpetol. Rev. 35:384), Crotaphytidae (Gluesing 1983. Copeia 1983:835–837), and Scincidae (Langkilde et al. 2003. Herpetol. J. 13:141–148). Among tropidurid lizards, this behavior has been observed in *Liolaemus lutzae* (Rocha 1993. Ciênc. Cult. 45:116–122) and *Eurolophosaurus nanuzae* (Galdino and Pereira 2002. Herpetol. Rev. 33:54) and *E. divaricatus* (Gomes et al. 2004; Kohlsdorf et al. 2004. Herpetol. Rev. 35:390–391), formerly *Tropidurus nanuzae* and *T. divaricatus* (Frost et al. 2001. Mol. Phylo. Evol. 21:352–371). Herein we augment available data on death-feigning in tropidurids with a brief description of this behavior in *Tropidurus torquatus* and *T. hispidus* and anecdotal records for several other species in the family.

On the morning of 21 April 2002, we observed a death-feigning display by a juvenile (35 mm SVL, 58 mm tail) *T. torquatus* following its hand capture in the urban area of Belo Horizonte, State of Minas Gerais, southeastern Brazil (19°45'S, 43°54'W; elev. 858 m). Upon capture, this individual became immobile, remaining motionless during the handling interval (about 30 s). The death-feigning posture persisted even after the animal was gently placed upside down on the ground (Fig.1A). After 1–2 min it righted itself and ran off. On 4 January 2005, an adult male *T. torquatus* (not measured) was captured by hand in a forested area of the Parque Nacional do Caparaó, municipality of Alto Caparaó, State of Minas Gerais (20°25'S, 41°50'W; elev. 1295 m). Similar to the first example, this individual became immobile upon capture, lying dorsally, extended its limbs upwards and closed its eyelids, remaining motionless during manipulation. The behavior persisted after we placed the animal upside down on the ground. After more than 1 min, it recovered and fled rapidly.

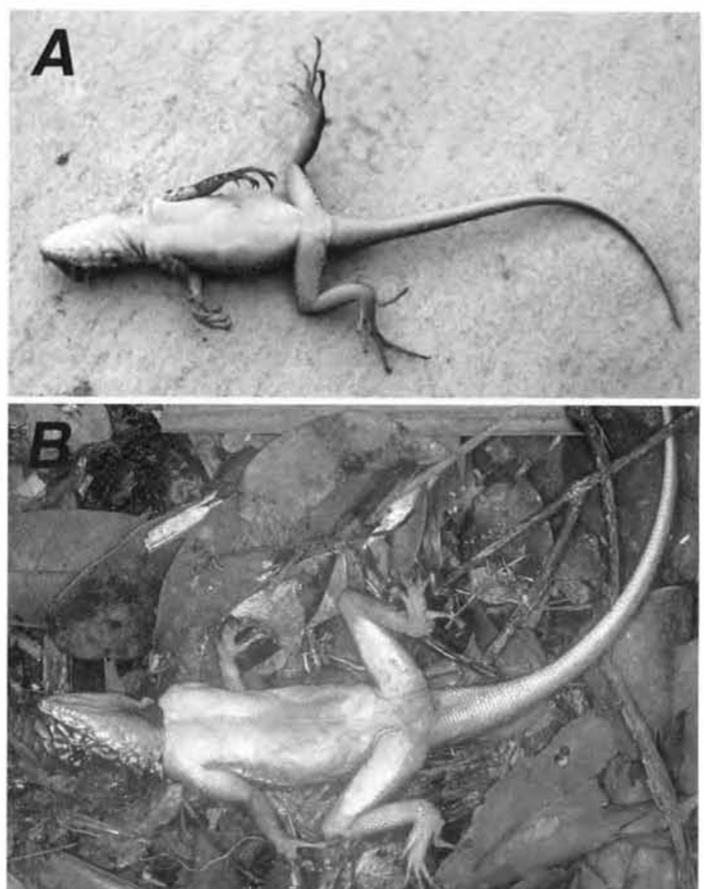

FIG. 1. Death feigning posture in (A) a juvenile *Tropidurus torquatus* from southeastern Brazil and in (B) an adult *Plica plica* from northern Brazil.

On the morning of 20 March 2005, we also observed death-feigning in an adult male *T. hispidus* (12.3 mm SVL, 14.9 mm tail, partly regenerated) following lace capture. The lizard was captured with a small lace mounted with 1 m of dental floss moored to a 1.5 m-length bamboo stick. The capture was made in the urban area of the municipality of Mucugê, State of Bahia, northeastern Brazil (13°00'S, 41°22'W; elev. 986 m; JC field number 1247). This animal's behavior was almost identical to those described above. It remained motionless for more than 1 min after release, then it ran to a rock crevice. On 15 March 2005 an adult male *T. hispidus* (not measured) that, surprisingly, was active at night (because of the presence of internal lights in the room) was captured by hand inside the headquarters building in Parque Municipal Sempre Viva, municipality of Mucugê (12°59'S, 41°20'W; elev. 967 m). After biting a thumb of JC and trying to escape by wriggling its body, it became quiescent. It persisted in this state for more than 1 min. As in the other cases, this individual recovered upon release and ran to a fissure in the house wall.

MTR has also observed death-feigning in many other tropidurids, including *Eurolophosaurus amathites*, *Plica plica* (Fig. 1B), *P. umbra*, *Strobilurus torquatus*, *Tropidurus cocorobensis*, *T. hygomy*, *T. itambere*, and *Uranoscodon superciliosum*. In all cases, the animals displayed a similar pattern of behavior and posture.

Death-feigning has not been recorded previously in *Tropidurus hispidus* (and *T. psamonastes*), even after extensive manipulation (Gomes et al. 2004. Amphibia-Reptilia 25:321–325). The similarity in this behavior among individuals of different species documented by our observations, and its widespread occurrence in the family lead us to conclude that death-feigning is a primitive characteristic in tropidurids, a conclusion also reached by Gomes et al., (*op. cit.*).

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TROPIDURUS ETHERIDGEI (NCN). **COURTSHIP**. Courtship in lizards involves many elaborate displays that are better known in iguanians and that are similar between species (Carpenter and Fergusson 1977. *In* Gans and Tinkle [eds.], Biology of the Reptilia: Volume 7. Ecology and Behaviour A, pp. 335–554. Academic Press, Orlando, Florida). Here, we report previously undescribed courtship in *Tropidurus etheridgei*.

Observations were made at 1715 h on 15 October 2003 (rainy season) in a rocky area near the municipality of Corumbá, Mato Grosso do Sul State, Brazil (19°10'49"S, 57°32'17.2"W, datum: WGS84; elev. 117 m). Courtship behavior took place on a rocky substrate near some terrestrial bromeliads (*Bromelia balansae*). The male (ca. 80 mm SVL), who displayed a bright blue dorsal coloration and red ventrolaterally and in the throat region, approached the female (ca. 60 mm SVL) with rapid series of head bobs for 1 min and circled her. The female raised up on four legs, arched her back, and presented her back to the male while raising her tail. The female slowly walked away from the male, who continue to pursue her for the next 10 min; over this period of time, he managed to bite the neck of the female twice and the base of her tail once. We did not observe copulation attempts.

Behavioral aspects of this courtship are quite similar to those described for other *Tropidurus* (Carpenter 1997. Herpetologica 33:285–289), except that they lack the swishing the tail from side to side and dewlap displays. Based on Carpenter (*op. cit.*), the female posture we recorded is a typical rejection posture showed by iguanids.

RWA thanks Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for a fellowship. We thank Marc P. Hayes for comments on an earlier draft of this note.

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TROPIDURUS ETHERIDGEI (Ututo). **ENDOPARASITES**. *Tropidurus etheridgei* occurs in Argentina, Bolivia, Brazil, and Paraguay. In Argentina, the species is distributed largely in the Chacoan region (Cei 1993. Reptiles del Noroeste, Nordeste y Este de la Argentina. Monogr. XIV. Mus. Reg. Sci. Nat. Torino, Italy. 949 pp.). The purpose of this note is to report *Physaloptera* sp. (Nematoda) in a population of *T. etheridgei* from Argentina.

Four *T. etheridgei* (mean SVL = 92 mm; range: 80–102 mm) from the herpetology collection of the Universidad Nacional del Nordeste (UNNEC 07916-07919), Corrientes, Argentina, were examined for helminths. All specimens are from Ingeniero Juárez, Formosa Province (23°54'S, 61°51'W, datum: WGS 84; elev. 57 m). The esophagus, stomach, small and large intestines were opened and examined under a dissecting microscope. The body cavity was also searched. One, four, and seven *Physaloptera* sp. were found in the stomachs of each of three of the *T. etheridgei*. In Argentina, *Physaloptera* sp. is known for *T. etheridgei* from Salta Province (Cruz et al. 1998. Herpetol. Nat. Hist. 6:23–31). Nematode infection frequency in the *T. etheridgei* from Ingeniero Juarez (75%) was higher than in *T. etheridgei* from Salta Province (64.5%). Also *Physaloptera* sp. have been found in others species of lizards from Argentina: *Leiosaurus belli* from Río Negro Province, *L. catamarcensis* from La Rioja Province, *Liolaemus neuquensis* from Neuquén Province (Goldberg et al. 2004. Comp. Parasitol. 2:208–214) and *Liolaemus quilmes*, *L. ornatus*, and *L. alticolor* from northwestern Argentina (Ramallo and Díaz 1998. Bol. Chil. Parasitol. 53:19–22). Ingeniero Juárez, Formosa, represents a new locality record for *Physaloptera* sp. in *T. etheridgei*.

We thank M. Hamman, B. Oscherov, B. Álvarez, and A. Hernando for advice on this work.

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TROPIDURUS HISPIDUS (Thornytail Lizard). **SAUROPHAGY**. Saurophagy is often opportunistic in lizards, involving either consumption of heterospecifics (Kiefer 1998. Herpetol. Rev. 29:41) or conspecifics (Kiefer and Sazima 2002. Herpetol Rev. 33:136; Vrcbradic and Rocha 1996. Herpetol Rev. 27:201–202). This behavior has been documented in some tropidurids (Avila and Belver 2000. Herpetol. Rev. 31:174; Avila and Morando 2002. Herpetol. Rev. 33:52; Galdino and Van Sluys 2004. Herpetol Rev. 35:173) but is undocumented in *Tropidurus hispidus*, a common diurnal species found in the Guianan Shield (Gorzula and Señaris 1998. Contribution to the Herpetofauna of the Venezuelan Guayana I. A Data Base. Scientia Guaianae No. 8. 269 pp.; Vitt et al. 1996. J. Trop. Ecol. 12:81–101). *Tropidurus hispidus* is sympatric with the nocturnal gekkonid *Hemidactylus palaichthus*; these two species can be found in syntopy but are largely segregated by activity period. Agonistic interaction between these two species has not previously been recorded. Hence, we document a case of attempted predation by *T. hispidus* on *H. palaichthus*.

During a visit to Maripa (town) in the lower basin of the Caura River, northeastern state of Bolívar, Venezuela (07°23'26"N, 65°10'56"W, La Canoa; elev. ca. 70 m), we found *T. hispidus* and *H. palaichthus* syntopic and both very common. At 0800 h on 5 October 2005, we observed an adult (estimated SVL 90 mm) *T. hispidus* persistently pursue on the floor of a rural house an adult (56 mm SVL) *H. palaichthus*, repeatedly biting at the gecko until it was captured. Upon perceiving the presence of FR, the *T. hispidus* immediately released its prey and quickly retreated to a hiding place among some tables. We collected the *H. palaichthus*, which was alive but severely wounded. Examination revealed that its tail had been lost, based on the condition of the scarred stump probably several days earlier. A large piece of dorsal skin (4.2 × 9.3 mm) was missing as a result of the *Tropidurus* bite (Fig. 1). On its venter near the inguinal region, an old scar was presemt that was similar to the bite on its back in size and shape.

While we examined the wounds of the gecko, we observed that the *T. hispidus* had emerged from its hiding place, ca. 5 m away, apparently searching for its prey. We released the gecko, observing from a prudent distance. Three minutes later, the *T. hispidus* moved cautiously in the direction of the gecko and when within one meter it ran quickly to the *H. palaichthus*, grabbing it by the head and swallowing it almost to midbody before returning to its retreat site to continue ingestion. We then attempted to capture both the predator and its prey, but the *Tropidurus* again released the gecko, which, surprisingly, was still alive. The *T. hispidus* evaded capture and the *H. palaichthus* was released after its photograph was taken.

A second *H. palaichthus* (MHNLS 17485) collected the day before these observations also had an old scar on its left shoulder very similar to the injury caused by the *T. hispidus* on the gecko noted previously. These observations led us to believe that attacks on *H. palaichthus* by *T. hispidus* at this locality might be more common than suspected and that the scars observed on the geckos reveal some capacity to survive these attacks.

Previous studies have shown that *T. hispidus* is insectivorous (León et al. 1970. Bol. Soc. Biol. Concepción 42:349–354; Vitt et al., *op. cit.*), although in one study, a single anuran prey item was recovered, representing the only vertebrate recorded in its diet (Vitt et al., *op cit.*). Collectively, these data lead us to believe that saurophagy by *T. hispidus* is opportunistic.

FIG. 1. The gecko, *Hemidactylus palaichthus*, showing dorsal skin trauma as the results of a *Tropidurus hispidus* bite.

J. Celsa Señaris verified the species identities of the lizards. Voucher material is deposited in the Museo de Historia Natural La Salle (MHNLS), under numbers 17482–17483 (*T. hispidus*) and 17484–17485 (*H. palaichthus*). We thank Aaron Bauer and Marc Hayes for comments and corrections to a preliminary version of this note.

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TROPIDURUS TORQUATUS (Brown Lizard). **ENDOPARASITES**. *Tropidurus torquatus* is a common lizard in Corrientes and Misiones provinces, Argentina (Cei 1993. Reptiles del Noroeste, Nordeste y Este de la Argentina. Monogr. XIV. Mus. Reg. Sci. Nat. Torino, Italy. 949 pp.). Here we report on the presence of *Parapharingodon* sp. (Nematoda) and larvae (cystacanths) of spiny-headed worms (Acanthocephala) in *T. torquatus* from northern Argentina.

We examined six *T. torquatus* (two juveniles, mean SVL = 51 mm, and four adults, mean SVL = 95 mm; range: 56–103 mm) from Corrientes (city), Corrientes Province (27°28'01"S, 58°47'00"W, datum: WGS 84; elev. 65 m) in the herpetological collection of Universidad Nacional del Nordeste (UNNEC): 8082–8084; 8086–8088. The esophagus, stomach, small and large intestines were opened and searched for helminths under a dissecting microscope. The body cavity was also searched. A total of 11 *Parapharingodon* sp. were found in the large intestines of four adults (numbers observed in each of the four were 1, 2, 3, and 5). We also found two acanthocephalan cystacanths in the stomach wall of one of the juveniles.

To date, previous reports of *Parapharingodon* sp. in *T. torquatus* have been documented for different localities from Brazil: Salvador and Canudos (Bahia), Cachimbo (Pará), Rio de Janeiro and Arraial do Cabo (Rio de Janeiro), Salobra (Mato Grosso do Sul), Mogeiro, Lagoa do Remígio, Umbeseiro and Joao Pessoa (Paraíba), Currais Novos, Ceará Mirin (Rio Grande do Norte), Garanhuns (Pernambuco) (Vicente et al. 1993. Rev. Brasiliera Zool. 10:19–168). Cystacanths of the acanthocephalan *Echinorhynchus* sp. have been found previously in Brazilian populations of this lizard (Vicente 1978. Atas Soc. Biol. Rio Janeiro 19:71–78). These findings represent the first record of *Parapharingodon* sp. and acanthocephalan cystacanths in *T. torquatus* from Argentina.

We thank M. Hamman, B. Oscherov, B. Álvarez, and A. Hernando for their advice.

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TROPIDURUS TORQUATUS (Brazilian Collared Lizard). **MORTALITY**. Humans produce innocuous-appearing artifacts that can negatively impact wild animal populations. The effects of some of these artifacts are well known (e.g., marine turtles ingesting plastic bags; Tomas et al. 2002. Mar. Pol. Bull. 44:211–216), but the effects of others remain undocumented. Hence, we document a case of accidental mortality apparently caused by such an artifact in *Tropidurus torquatus* from southeastern Brazil.

On 10 August 2000, we found a recently dead subadult male *T. torquatus* (53.7 mm SVL, 78.3 mm tail) trapped in a small piece of plastic spiral (38 mm length × 12 mm internal diameter). The animal was found on a granite outcrop near an Atlantic forest remnant located at the southern limit of the Universidade Federal do Espírito Santo, Vitória, Estado do Espírito Santo (20°16'41.3"S, 40°18'23.9"W, datum: SAD 69 Corrego Alegre; elev. 17 m).

Such plastic spirals are heavily used around the campus to bind xerox copies and class reports. Many end up broken and thrown away to be later inadvertently gathered by the gardeners that collect leaves, vegetation litter, and cut grass. These materials are used as unprocessed fertilizer or to protect exposed soil. Non-biodegradable material tends to become exposed within a few months after wet season processing decomposes organic matter and rains wash away most of the debris of smaller size. This allows lightweight, human-made, degradation-resistant material to be dispersed by wind across bare ground or rock, which is the typical habitat of this lizard (Fredericksen et al. 2003. Trop. Ecol. 44:183–194). Our observation reinforces concerns regarding the impacts of poorly degradable human-made artifacts.

The *T. torquatus* specimen (MBML 1746) was deposited in the herpetological collection of the Museu de Biologia Melo Leitão, Santa Tereza, Espírito Santo, Brazil.

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TROPIDURUS TORQUATUS (Collared Lizard, Calango). **PREY.** Lizards of the widely distributed South American genus *Tropidurus* (Rodrigues 1987. Arq. Zool., São Paulo 31:105–230) are sedentary foragers that feed predominantly on arthropods (Van Sluys 1993. J. Herpetol. 27:347–351). However, they can also prey on other lizards (e.g., Galdino and Van Sluys 2004. Herpetol. Rev. 35:173; Kiefer 1998. Herpetol. Rev. 29:41; Kokubum and Lemos 2004. Herpetol. Rev. 35:270–271; Teixeira and Giovanelli 1999. Rev. Brasil. Biol. 59:11–18), including conspecifics (e.g., Alvarez et al. 1985. Hist. Nat. 5:281–288; Dias and Rocha 2004. Herpetol. Rev. 35:398–399; Kiefer and Sazima 2002. Herpetol. Rev. 33:136). Here we record three cases of predation on vertebrates (two lizards and a treefrog) and one case of cannibalism from coastal populations of *Tropidurus torquatus*.

Lizards were captured during a study carried out in "restinga" habitats in the States of Rio de Janeiro, Espírito Santo, and Bahia (16°39'–23°05'S, 39°05'–43°30'W; datum: WGS 84; elev. 2–12 m) from November 1999 to March 2000 and dissected for stomach content analysis. We found a partially digested juvenile (ca. 33.0 mm SVL) *T. torquatus* lacking its midbody and right posterior limb in an adult male (60 mm SVL) from Guriri restinga, State of Espírito Santo, in November 1999.

We also recorded predation on other vertebrates in Jurubatiba (January 2000) and Maricá (February 2000) restingas, both in the State of Rio de Janeiro, by adult males of *T. torquatus*. In Jurubatiba, one male (79 mm SVL) had consumed a juvenile (ca. 29.7 mm SVL) *Mabuya macrorhyncha*. In Maricá, a male (84.0 mm SVL) had eaten a juvenile (ca. 42.0 mm SVL) *Cnemidophorus littoralis* (only the posterior body and the left hindlimb were undigested), and another male (ca. 74.4 mm SVL) preyed on an adult female *Scinax cuspidatus* (ca. 27.5 mm SVL), which was partially digested. We also found a piece (ca. 37.8 mm) of a tail of an adult *M. macrorhyncha* in the stomach of an adult male *T. torquatus* from Jurubatiba.

Predation by *T. torquatus* on other vertebrates has been previously recorded on conspecifics (Alvarez et al. 1985, *op. cit.*; Dutra 1996. Uso de habitats, tamanho, dieta e locais de desova de *T. torquatus* [Sauria: Tropiduridae] em Abrolhos, BA. Bachelor Thesis, Instituto de Biologia, Universidade Federal de Minas Gerais, Belo Horizonte. 56 pp.) and on the lizards *Mabuya agilis* (Teixeira and Giovanelli, *op. cit.*), *Hemidactylus mabouia* (Araújo 1991. Rev. Bras. Biol. 51:857–865; Teixeira and Giovanelli, *op. cit.*; Galdino and Van Sluys, *op. cit.*), *Gymnodactylus darwinii* (Teixeira and Giovanelli, *op. cit.*), *Cnemidophorus ocellifer* (Kokubum and Lemos, *op. cit.*), and on the treefrog *Scinax cuspidatus* (Araújo, *op. cit.*). Nevertheless, our observations of predation on *M. macrorhyncha* and on the endemic *C. littoralis* (a species threatened with extinction) constitute the first records for these taxa where *T. torquatus* was the predator. All lizards preyed upon by *T. torquatus* were juveniles, and their frequencies of occurrence among the prey sampled were low (< 4%), implying that this feeding behavior is opportunistic.

We thank the CNPq for the grants (No. 146442/1999-7 and 150353/2003-0 to MCK, No 307653/2003-0 and 477981/2003-8 to CFDR, and No 301401/2004-7 to MVS), the FAPERJ (CCS), and partially the PELD / CNPq - Site 5 Restinga de Jurubatiba and the Programa de Pós-Graduação em Ecologia, IB, Unicamp. The permit for collecting lizards was given by IBAMA (process

2001.03486/99.85). Rodrigo V. Marra and Davor Vrcibradic confirmed the identity of *S. cuspidatus* and *M. macrorhyncha*, respectively. Davor Vrcibradic kindly revised the text.

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SERPENTES

AGKISTRODON CONTORTRIX (Copperhead). **DIET**. On 14 September 2004 at 0800 h, one of us (RDG) witnessed a vehicle strike a Copperhead (*Agkistrodon contortrix*) on a secondary gravel road in Botetourt Co., Virginia, USA (37°40.46'N, 79°49.52'W). The snake was collected and brought to the Department of Biology at Hollins University, where the specimen was dissected as a demonstration for students. The cranial region of the intact female snake (680 mm SVL, 762 mm TL) was the only area showing any trauma. Dissection of the stomach revealed an intact, adult female Eastern Wormsnake (*Carphophis amoenus amoenus*; 215 mm SVL) and an intact Orange-tipped Oakworm Moth (*Anisota senatoria*; a previously unreported food item of *A. contortrix*). Brown (1979. Brimleyana 1:113–124) reported *C. a. amoenus* in the gut contents of juvenile *A. contortrix*, and Palmer and Braswell (1998. Reptiles of North Carolina. University of North Carolina Press) reported *C. a. amoenus* in the gut contents of *A. contortrix* in museum specimens. As this is the third documented account of *C. a. amoenus* in the gut contents of *A. contortrix*, we should consider that *A. contortrix* may forage more fossorially, or that *C. a. amoenus* may spend more time above ground, than previously thought. The *A. contortrix* specimen and its gut contents are deposited in the Department of Biology at Hollins University (HU0151).

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CROTALUS CATALINENSIS (Santa Catalina Island Rattlesnake). **WINTER ACTIVITY**. Grismer (2002. Amphibians and Reptiles of Baja California, Including Its Pacific Islands and the Islands in the Sea of Cortés. University of California Press, Berkeley, California. 409 pp.) reports an activity period spanning from March through October for *Crotalus catalinensis*. However, during a visit to Santa Catalina Island in the winter season (November–February), we found 28 *C. catalinensis* active on the surface. On both 26 and 27 January 2005 a group of five persons searched for snakes from 1200–1600 h and from 1900–2400 h, although not every person searched this entire time period. Sunset was at approximately 1900 h; thus, a total of eleven person-hours were spent searching during the day and 25 person-hours were spent searching at night. We found four *C. catalinensis* (two males, one female, one undetermined) during the day (0.4 snakes/person-hour), whereas 24 *C. catalinensis* (five males, nine females, ten undetermined) were found at night (1.0 snakes/person-hour). When first encountered, fourteen individuals (including those found during the day) were coiled, while the rest were crawling. One male and a female were found together under a rock, but copulation was not observed. With the aid of an infrared thermometer we observed that snakes' body temperatures ranged from 14.2–30.2°C (18.7°C mean, N = 26), and air temperatures at point of snake encounters ranged from 18.0–28.0°C (21.3°C mean, N = 18).

On the night of 26 January, we attached a bobbin of thread (4 g) to the last third of the body of six snakes (four females and two males), and released them at their respective capture sites. The next morning, several females were found some distance from their capture sites (F1, ca. 630 mm SVL, 21.9 m; F2, ca. 600 mm SVL, 31.8 m; F3, ca. 380 SVL, 16.3 m). Another female (F4, ca. 670 mm SVL) and a male (M1, ca. 700 mm SVL) that were captured under the same rock had moved together around a Palo Verde Tree (*Cercidium microphyllum*) and separated; F4 traveled 22 m and M1's bobbin fell off a short distance from the release site. A second male (M2, ca. 620 mm SVL) only moved 0.5 m. On the morning of 28 January, females F1 and F4 had lost their bobbins at distances of ca. 88 m and 44 m from their last locations, respectively. In general, snake movements were linear, passing under or climbing on vegetation to a height of 0.6 m. Diurnal refugia included cavities beneath rocks, fallen Cardon Cactus (*Pachycereus pringlei*), and thickets of plants. In all cases the snake's body could be seen from above.

Capture rates on these winter nights approximate those I recorded during the 2004 rainy season (July–October), when 30 person-hours yielded 38 rattlesnakes (1.2 snakes/person-hour). These observations indicate that *C. catalinensis* also can be quite active during the winter, especially at night. The behavior and displacements observed here suggest that winter activity of *C. catalinensis* might be related to mating activities.

Suppositions of an activity season limited to March through October might be due to a lack of field work in winter, when northwesterly winds in the Gulf of California result in poor sailing conditions (Roden 1958. Pac. Sci. 12:21–45). My observations of winter activity in *C. catalinensis* are consistent with activity patterns exhibited by the closely related *Crotalus ruber* (Murphy and Crabtree 1985. Acta Zool. Mex. 9:1–16), which can be found dead on the roads of Baja California Sur by mid-February (pers. obs.).

I thank M. Martins, G. Arnaud, J. Navarro, and M. A. Leal for their assistance.

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CROTALUS CERASTES (Sidewinder). **DIET**. Although *Crotalus cerastes* are known to feed on lizards, sympatric *Sceloporus magister* (Desert Spiny Lizard) have not been reported in their diet (Funk 1965. Herpetologica 21:15–17). On 25 May 2003 at ca. 1200 h a dead *C. cerastes* (ca. 300 mm TL) was found on the side of Nipton Road, Nipton, California,USA, adjacent to Mojave National Preserve. Upon dissection I found a partially digested adult (ca. 152 mm TL) *S. magister* in the specimen's stomach.

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CROTALUS MOLOSSUS (Black-tailed Rattlesnake). **BEHAVIOR.** Here we report communal hibernation of *Crotalus molossus* in northern Yavapai Co., Arizona, USA. In Cochise Co., Arizona, *C. molossus* do not appear to aggregate during hibernation, but rather hibernate singly in crevices along rim rocks (Greene 1997. Snakes: The Evolution of Mystery in Nature. University of California Press, Berkeley. 351 pp.). However, Cochise Co. is near the latitudinal median of the range of *C. molossus*, while the Yavapai Co. populations we studied are nearer the northern terminus of its range (Campbell and Lamar 2004. The Venomous Reptiles of the Western Hemisphere. Cornell University Press, Ithaca and London. 774 pp.) and occur at relatively high elevations (1370–1675 m).

We have observed multiple *C. molossus* at 14 hibernacula in desert scrub, chaparral, and woodland communities. We have observed up to eight *C. molossus* simultaneously at a single hibernaculum and marked up to 22 individual *C. molossus* over three years at a single hibernaculum. All hibernacula were located at the base of large bedrock outcrops and ledges (> 2 m) comprised of limestone, granite, or schist, with immediately adjacent boulders and cobbles. Other species of snakes utilizing these hibernacula included Arizona Black Rattlesnake (*C. cerberus*), Black-necked Gartersnake (*Thamnophis cyrtopsis*), Striped Whipsnake (*Masticophis taeniatus*), and Western Lyresnake (*Trimorphodon biscutatus).* High site fidelity has been documented in *C. molossus* at these sites and at Tonto National Monument (Gila and Yavapai counties, Arizona) through radio-telemetry and mark-recapture research (M. Spille, G. Schuett, and E. Nowak, unpubl. data). Our observations demonstrate that *C. molossus* hibernates communally in northern, high elevation portions of its range. To our knowledge, this is the first report of communal hibernacula in *C. molossus*.

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CROTALUS SCUTULATUS SCUTULATUS (Mohave Rattlesnake). **ALBINISM**. Albinism has been previously documented in five species of *Crotalus*: *C. adamanteus, C. atrox, C. durissus, C. horridus,* and *C. viridis* (e.g., Hensley 1959. Albinism in North American Amphibians and Reptiles. Publ. Mus. Mich. State Univ. 1:133–159; Klauber 1972. Rattlesnakes. Their Habits, Life Histories, and Influence on Mankind. Univ. California Press, Berkeley, California. 1476 pp.; Dyrkacz 1981. Recent Instances of Albinism in North American Amphibians and Reptiles. SSAR Herpetol. Circ. No. 11. 31 pp.). This is the first record of albinism in *Crotalus scutulatus*.

On 30 May 2000, one of us (BA) collected a small (ca. 600 mm) female albinistic rattlesnake in sparsely vegetated desert, dominated by Creosote Bush (*Larrea tridentata*), in northeastern Kern Co., California, USA (ca. 35°35'N, 117°47'W, ca. 800 m elev.). The specimen's background color was yellowish-white with faint diamond-shaped dorsal blotches that were faintly outlined with a darker hue and bordered posteriorly by single rows of whitish scales. The tail was marked with three gray caudal rings, each being one scale row in width and separated by nearly white rings comprised of three scale rows each. The proximal rattle segment was uniformly pale yellow. The irises were tan and the tongue was pink. The crown of the head was devoid of scales in the frontal and prefrontal areas, except for a few widely separated fragments.

The faintly visible pattern, as well as the general body morphology, collection location, and habitat, were consistent with an identification of *C. scutulatus*. In captivity, this specimen has since produced typical *C. scutulatus* offspring with a normally pigmented male. Digital color images of the specimen have been deposited at the San Diego Natural History Museum (SDSNH-HerpPC 5201–03).

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CROTALUS SCUTULATUS SCUTULATUS (Mohave Rattlesnake). **MORPHOLOGY**. Absence of the rattle has been reported in six species of *Crotalus*: *C. cerastes, C. horridus,* and *C. pricei* (Klauber 1956. Rattlesnakes. Their Habits, Life Histories, and Influence on Mankind. Univ. California Press, Berkeley, California. 1476 pp.), *C. atrox* (Painter et al. 1999. Herpetol. Rev. 30:44; Holycross 2000. Herpetol. Rev. 31:177–178), *C. viridis* (Painter et al., *op. cit.*; Holycross, *op. cit.*), and *C. lepidus* (Christman et al. 2004. Herpetol. Rev. 35:62). Herein we report a mature male *Crotalus scutulatus* (LACM 159667) exhibiting total absence of the external rattle and internal rattle shaker.

The frozen headless carcass (ca. 800 mm SVL, ca. 58 mm tail length) was examined by one of us (MDC) on 8 June 2002, after having been killed in late August 1999 near Adelanto, San Bernardino Co., California, USA (ca. 34°32'52"N, 117°31'18"W, ca. 940 m elev.). Sex was verified by an everted hemipenis. Twenty-five subcaudal scales were present, consistent with the range noted (22–28, mean = 25 ± 0.2 SE) for males (N = 34) in a nearby series of *C. scutulatus* (Cardwell, unpubl. data). The exposed skin at the terminus was sooty black and surrounded by a margin of irregularly sized and shaped scales. Radiographs revealed the absence of the internal rattle shaker. It was determined that previous repeated freezing and thawing of the carcass would likely render a histological examination for scar tissue inconclusive. Digital photographs and radiographs have been deposited in the Natural History Museum of Los Angeles County (LACM-PC 1405–1411).

We thank R. Crombie, S. Goldberg, J. Jarchow, B. Moon, A. Rabatsky, and G. Schuett for advice regarding the possible etiology of this deformity and/or the potential for a conclusive determination.

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ELAPHE SPILOIDES (Central Ratsnake) **HABITAT USE.** As forests become more fragmented, the proportion of edge habitat increases. In Ontario and the northeastern United States, *Elaphe spiloides* occurs more frequently in edge habitat than due to chance (Blouin-Demers and Weatherhead 2001. Ecology 82:2882–2896; Durner and Gates 1993. J. Wildl. Manag. 57:812–826), possibly because of an increased number of avian (Paton 1994. Conserv. Biol. 8:17–26) and small mammalian prey (Blouin-Demers and Weatherhead, *op. cit.*) in this habitat type. Edge use by ratsnakes might also reflect their increased ability to thermoregulate in this habitat because of increased sun exposure (Weatherhead and Charland 1985. J. Herpetol. 19:12–19). Here, we report the habitat use and home range size of *E. spiloides* in an agriculturally fragmented forest environment in Clark Co., Illinois, USA.

Six *E. spiloides* were implanted with radio-transmitters (Model SI-2T, Holohil Systems, Ltd., Ontario, Canada) and relocated every 1–2 days between 19 May 2003 and 7 November 2004 (except during hibernation). Ambient (ca. 30 cm above shaded ground) and subject body temperatures were recorded at the time of each relocation. Spatial data was analyzed using ArcView Geographic Information System (GIS, v 3.2) or ArcGIS 8.1 (ESRI, Redlands, California) with the Xtools Extension (DeLaune 2000. Oregon Department of Forestry, Salem, Oregon), Spatial Analyst Extension, and Animal Movement Extension (Hooge and Eichenlaub 2000. Alaska Science Center – Biological Science Office, U.S. Geological Survey, Anchorage, Alaska). Individual locations were plotted using UTM coordinates on Illinois Digital Orthophoto Quadrangle (DOQ) maps imported into ArcView GIS. We calculated the home range size of each individual using the minimum convex polygon method (Jennrich and Turner 1969. J. Theor. Biol. 22:227–237). Habitat types (Table 1) were quantified within home ranges by defining habitat boundaries on the DOQ maps within ArcGIS. Edge habitat (± 15 m of the boundary between forest and any open habitat; following Blouin-Demers and Weatherhead, *op. cit.*), was assigned as a unique habitat type to test for edge preference.

Mean mass (± 1 SE) of the subjects was 654.5 ± 109.0 g, and mean snout–vent length was 119.8 ± 11.3 cm. Mean ambient temperature and snake body temperature during relocations were 23.6 ± 0.3°C and 23.2 ± 0.3°C, respectively. Subject body temperature exceeded ambient temperature during 40.8% of the relocations. Snakes were relocated a total of 417 times over periods ranging from 58 to 428 days, providing 212 sample points for the determination of home range sizes and patterns of habitat use. The mean home range size was 9.65 ± 3.62 ha. Subjects used the seven habitat types non-randomly ($G = 106.50$, df = 6, $P < 0.001$; Table 1). Of the dominant habitat types (i.e., agricultural field, deciduous forest, edge, and grassland/pasture), snakes occupied forest and forest edges more often than would be expected due to chance, and appeared to avoid open habitats ($G = 101.90$, df = 3, $P < 0.001$). Subjects also occupied forest edges more often than forest interiors, despite the fact that the latter comprised a greater proportion of available habitat ($G = 83.92$, df = 1, $P < 0.001$; Table 1).

The mean home range for *E. spiloides* in this study was on the higher end of the distribution of home ranges reported for populations in less fragmented habitats (e.g., Mullin et al. 2000. Herpetol. Rev. 31:20–22), possibly reflecting decreased availability of resources for snakes at our study site. Our subjects were located in

TABLE 1. Pooled number of observed and expected relocations (based on proportions of habitats within a subject's home range) for six *Elaphe spiloides* radio-tracked in Clark County, Illinois, between 19 May 2003 and 7 November 2004.

Habitat Type	Observed	Expected
Agricultural Field	0	24.8
Deciduous Forest	89	124
Edge	114	60.9
Grasses	8	2.6
Buildings	1	0.1
Residential Yard	0	0.2
Road/Driveway	0	0.2

edge habitat more often than expected (Table 1), a finding that is consistent with previous studies conducted in the northeastern U.S. (Blouin-Demers and Weatherhead, *op. cit.*; Durner and Gates, *op. cit.*). Our results contrast, however, with a study of ratsnakes in Vermillion Co., Illinois (110 km N of Clark Co., Illinois) in which ratsnakes were associated with forest habitat but were not consistently located in edges (Keller and Heske 2000. J. Herpetol. 34:558–564). In addition to assessing the impacts of anthropogenic habitat fragmentation on other snake species, future studies should explore the effects of edge habitat availability on *E. spiloides* population structure and dynamics.

Robert Szafoni of the Illinois Department of Natural Resources (IDNR) initiated this project, and the IDNR provided funding. Collections were authorized by permit #NH03-0946 (IDNR), and surgical procedures were approved by IACUC protocol #04-007.

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MASTIGODRYAS MELANOLOMUS (Salmon-bellied Racer). **ENDOPARASITES.** *Mastigodryas melanolomus* is known on the Atlantic versant from Tamaulipas, Mexico, to western Panama and on the Pacific slope from Nayarit to western Guatemala, Costa Rica, and western and central Panama (Savage 2002. The Amphibians and Reptiles of Costa Rica. A Herpetofauna Between Two Continents Between Two Seas. University of Chicago Press, Chicago, Illinois. xx + 934 pp.). There are, to our knowledge, no published reports of endoparasites from *M. melanolomus*. The purpose of this note is to report one species of Cestoda, two species of Acanthocephala, and one species of Nematoda from *M. melanolomus*.

Seventy-one *M. melanolomus* from Costa Rica (SVL = 680 mm ± 114 SD, range: 422–941 mm) collected 1958–1962, 1964, 1966, 1967, 1971, 1974, 1982, 1983, 1985, from Alajuela Province (LACM 153462, 153475, 153505, 153509); Cartago Province (153416, 153419, 153422, 153424, 153426, 153428,153430–153436, 153439, 153441, 153445, 153460, 153463, 153466, 153469, 153474, 153477, 153478, 153480–153482, 153507, 153512); Guanacaste Province (153420, 153458,153465, 153520); Heredia Province (153453, 153461, 153518); Limón Province (153423, 153427, 153429,153438, 153443, 153446, 153483, 153510, 153511, 153516, 153517); Puntarenas Province (114114, 153418, 153421, 153425, 153442, 153450-153452, 153457, 153476, 153506, 153508, 153523); San José Province (153417, 153437, 153440, 153472, 153473, 153479, 153513, 153514) were examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California. A mid-ventral incision was made in the body wall; organ surfaces and mesenteries in the posterior portion of the body cavity were visually examined for helminths. Found were larval Cestoda (metacestodes in cysts), (prevalence [infected snakes/snakes examined × 100] = 13%; mean intensity [mean number of helminthes per infected lizard ± 1 SD] = 2.0 ± 1.7; range [minimum to maximum number per host] = 1–6; larval Acanthocephala (centrorhyhchid cystacanths) prevalence = 3%; mean intensity: 1.0; range: 1; Acanthocephala (oligacanthorhynchid cystacanths) prevalence = 7%; mean intensity: 3.2 ± 2.2; range: 1–6; Nematoda, larval *Porrocaecum* sp. prevalence = 3%; mean intensity 5.0 ± 5.7; range: 1–9. These were prepared as whole mounts using standard parasitological techniques (Cestoda, Acanthocephala) or cleared in glycerol (Nematoda) and identified. Vouchers were deposited in the United States National Parasite Collection (USNPC) as Cestoda: metacestode larvae (98663); Acanthocephala: Centrorhynchidae (98665); Oligacanthorhynchidae (98666); Nematoda: *Porrocaecum* sp. (98664).

Mastigodryas melanolomus feeds mainly on lizards but may also eat snakes, birds, and small mammals (Savage 2002, *op. cit.).* The juvenile Cestoda (metacestodes) (Roberts and Janovy 2005. Gerald D. Schmidt & Larry S. Roberts' Foundations of Parasitology. McGraw Hill, Boston, Massachusetts. 702 pp.), juvenile Acanthocephala (centrorhynchs), and larval Nematoda *(Porrocaecum* sp.) probably reached *M. melanolomus* by the ingestion of infected prey items. *Mastigodryas melanolomus* likely functions as a paratenic (transport host) with development to the adult parasite occurring when the snake is eaten by a predator. This is further suggested as adults of *Porrocaecum* are normally found in birds (Anderson 2000. Nematode Parasites of Vertebrates: Their Development and Transmission. CABI Publishing, Wallngford, Oxon U.K. 650 pp.). None of the helminths found in this study was unique to Costa Rica or *M. melanolomus* (Goldberg and Bursey 2004. Carib. J. Sci. 40:62–69). Cestoda metacestode larvae, Acanthocephala centrorhynchid and oligacanthorhynchid cystacanths and Nematoda, *Porrocaecum* sp. in *M. melanolomus* are new host records.

We thank Christine Thacker (LACM) for permission to examine snakes which are part of the CRE collection donated to LACM by Jay M. Savage in 1998.

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NERODIA RHOMBIFER (Diamond-backed Watersnake). **FORAGING BEHAVIOR**. On 5 August 2005, we captured an adult male *N. rhombifer* (760 mm SVL, 244 mm tail length) in a shrimp trap that had been set 3 m deep on the bottom of the Atchafalaya River near the town of Butte La Rose in St. Martin Parish, Louisiana, USA. The river had muddy banks and bottom, was near minimum low-stage water flow, had water clarity of about 0.3 m, and lacked submerged vegetation. The snake was in the final stages of drowning when removed from the trap at about 0900 h, and hence probably entered the trap within the preceding hour. The trap was 25 cm in diameter, 76 cm long, and made of 6 mm (mesh size) hardware cloth, with a 4 cm opening in the throat. A partially decomposed long-nosed gar (*Lepisosteus osseus*) was placed in the trap as bait. In addition to the snake and bait, the trap contained about 12 medium-sized river shrimp (*Macrobrachium ohione*) and several small blue catfish (*Ictalurus furcatus*). Maximum foraging depths have not been reported for this species, although it has been observed diving in open water that was at least 3 m deep (Keck, unpubl. data, cited in Gibbons and Dorcas 2004. North American Watersnakes: A Natural History. Norman, Univ. Oklahoma Press). Our trapped specimen demonstrated a foraging depth of at least 3 m, which supports the hypothesis of Mushinsky et al. (1982. Ecology 63:1624–1629) that large watersnakes forage in deep, open water. The snake's stomach was empty. Given the strong preference of *N. rhombifer* for fish prey (Gibbons and Dorcas 2004) and the murky water, we suspect that the snake used chemosensory cues to find the strong-smelling bait fish or the catfish in the trap.

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NINIA MACULATA (Spotted Coffee Snake). **ENDOPARASITES.** *Ninia maculata* is known from northeastern Honduras, Nicaragua, Costa Rica, and western Panama (Savage 2002. The Amphibians and Reptiles of Costa Rica. A Herpetofauna Between Two Continents Between Two Seas. University of Chicago Press, Chicago, Illinois. xx + 934 pp.). To our knowledge, there are no published reports of endoparasites from *N. maculata.* The purpose of this note is to report two species of Nematoda from *N. maculata.*

Eleven *N. maculata* from Costa Rica (SVL 222 ± 23 mm SD, range: 178–258 mm) were collected 1962–1964, 1966, 1967 from Cartago Province (LACM 153828) and San José Province (LACM 153826, 153833–153837, 1538430, 153842, 153843, 153851). A mid-ventral incision was made, and the digestive tract was removed. The esophagus, stomach, small and large intestines, and body cavity were examined for endoparasites using a dissecting microscope. Two species of Nematoda were found: mature males and gravid females of *Cosmocercoides variabilis* (infection site: small and large intestines; prevalence [infected snakes/snakes examined × 100] = 45%; mean intensity [mean number of helminths per infected lizard ± 1 SD] = 8.4 ± 9.5; range [minimum to maximum number per host] = 1–24); juveniles of *Cruzia* sp. (infecton site: small and large intestines; prevalence = 18%; mean intensity = 4.5 ± 0.7; range = 4–50). These were cleared in glycerol for study, then deposited in the United States National Parasite Collection, *Cosmocercoides variabilis* (USNPC 98852) and *Cruzia* sp. (USNPC 98853).

Two species of *Cosmocercoides* occur in the Americas, *C. dukae* and *C. varabilis* (Vanderburgh and Anderson. 1987. Can J. Zool. 65:1650–1661). The major difference between the two species is the number of rosette papillae of the male: *C. dukae* with 12 pairs; *C. variabilis* with 14–20 pairs. We have assigned these individuals to *C. variabilis* because the males possess 14 or 15 pairs of rosette papillae. *Cosmocercoides variabilis* is widely distributed in North America, where it has been reported from Caudata, Anura, Squamata, and Chelonia (Baker 1987. Mem. Univ. Newfoundland Occas. Pap. 11:1–325). Species of *Cruzia* are primarily parasites of mammals but have been reported from several species of amphibians and reptiles (Baker, *op. cit.*). Transmission of *C. variabilis* and species of *Cruzia* is direct and does not involve an intermediate host (Anderson 2000. Nematode Parasites of Vertebrates. Their Development and Transmission. 2nd Ed. CABI Publishing, Oxon, UK. xx + 650 pp.). *Ninia maculata* represents a new host record and Costa Rica is a new locality record for both *C. variabilis* and *Cruzia* sp.

We thank Christine Thacker (LACM) for permission to examine snakes, and Jessica Carlson and Dustin Goto (Whittier College) for assistance with dissections. Specimens of *N. maculata* are part of the CRE collection donated to LACM by Jay M. Savage in 1998.

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OPHIOPHAGUS HANNAH (King Cobra). **DIET**. Despite the common assertion that King Cobras primarily eat snakes, or snakes and occasionally varanids (e.g., Evans 1902. J. Bombay Nat. Hist. Soc. 14:409–418; Smith 1943. Fauna of British India: Reptilia and Amphibia, Vol. III, Serpentes. Taylor & Francis, London), few specific records of the diet of *Ophiophagus hannah* exist in the literature. Furthermore, dietary records in this species are geographically clustered, despite the species' broad distribution. Eight of 10 records that I found in which a specific prey item was named are from India. One other record (Craddock 1903. J. Bombay Nat. Hist. Soc. 15:143) is from Malaysia. Wray (1907. J. Fed. Malay States Mus. 64–65) reported on the diet of the King Cobra without naming localities for the specimens; presumably these snakes were also from Malaysia. I found no records of the diet of *O. hannah* in the wild in Thailand.

On 7 February 2005 at 0947 h, I observed a juvenile *O. hannah* (ca. 2 m SVL) beginning to swallow an adult *Rhabdophis nigrocinctus* (ca. 70 cm SVL). I was alerted to the presence of the snakes by their struggle, and when I returned with a camera, the cobra was in the process of ingesting the keelback head-first. I photographed the snakes to confirm their identities (KU Digital Archive, KUDA 001722). Both snakes were on the ground in a clearing around a small pond, about 5 m from the forest edge and 5 m from the pond edge, in dry, evergreen forest at Sakaerat Environmental Research Station, Nakhon Ratchasima Province, northeast Thailand (14°29'43.4"N, 101°55'07.4"E).

I thank A. Bauer, J. G. Hill, and Rudkin Fund of the University of Kansas Natural History Museum and Biodiversity Research Center for assistance.

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REGINA RIGIDA (Glossy Crayfish Snake). **MAXIMUM SIZE**. An adult male *Regina rigida* collected 30 March 2005, 10 mi E of Pollock (Grant Parish, Louisiana, USA) measured 830 mm TL. This exceeds the previous record of 797 mm total length (Shoop 1959. Herpetologica 15:160) by 33 mm. The specimen is deposited in the vertebrate collection of Louisiana State University Museum of Zoology (LSUMZ 89683).

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REGINA SEPTEMVITTATA (Queen Snake). **PREDATION.** Reports of arachnids preying on snakes are uncommon (Bayliss 2001. Herpetol. Rev. 32:49; Groves and Groves 1978. Bull. Maryland Herpetol. Soc. 14:44–46; Lazcano et al. 2005. Herpetol. Rev. 36:186; McCormick and Polis 1982. Biol. Rev. 57:29–58; Zippel and Kirkland 1998. Herpetol. Rev. 29:46). Some spiders have been noted to feed on small snakes (Groves and Groves, *op. cit.*; McCormick and Polis, *op. cit.*), and a few species have been found entangled in spiderwebs (e.g. Bayliss, *op. cit.*; Zippel and Kirkland, *op. cit.*). Here, I report the first account of a spider feeding on the carcass of a subadult *Regina septemvittata*.

At 1025 h on 24 May 2003, a deceased *R. septemvittata* (325 mm SVL) was discovered while being eaten by an adult *Dolomedes tenebrosus* in Wilson Co., Tennessee, USA. The spider, an adult female with a ca. 7 cm legspan, was feeding on the snake's flesh ca. 3 cm posterior to the head under a large rock situated on the bank of Fall Creek (ca. 7 m wide). It is unclear if the spider killed the snake or located the carcass and began to consume it. Because both species appear to be abundant and share the same riparian habitats, predation by *D. tenebrosus* on *R. septemvittata* might not be uncommon.

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