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Diet: Charina bottae

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TABLE 1. Presence of physical characteristics in male and female *Uroplatus henkeli*.

Sex	N	Vertebral stripe	Dorsal striations	Cranial markings
Male	50	19 (38.0%)	50 (100%)	2 (4.0%)
Female	50	0	0	45 (90.0%)

The horizontal black marking on the cranium (Fig. 2) was observed in 90% of the females and 4% of the males (Table 1). Thus our data are strongly suggestive of juvenile sexual dimorphism in *Uroplatus henkeli*.

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NATURAL HISTORY NOTES

Instructions for contributors to Natural History Notes appear in Volume 36, Number 1 (March 2005).

CAUDATA

ENSATINA ESCHSCHOLTZII OREGONENSIS* x *PICTA (Oregon x Painted Salamander Intergrade). **BEHAVIOR.** *Ensatina eschscholtzii* is the most widespread and common plethodontid salamander in western North America, with the range extending from southern British Columbia to northern Baja California (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co., Boston, Massachusetts. 336 pp.). However, little is known about the climbing behavior of this salamander. In addition, little is known about the climbing behavior of *Batrachoseps attenuatus* or *Taricha granulosa* (Hayes and Hayes 2003. Herpetol. Rev. 34:45–46; Aubry 2000. J. Wildl. Mgmt. 64:1041–1052; Jones and Aubry 1985. Herpetol. Rev. 16:26; Stebbins 1954. Univ. California Publ. Zool. 54:47–124).

An extended period of observation of the climbing behavior of terrestrial salamanders and their use of stumps as habitat was performed from 23 Nov 2001 to 29 Mar 2003. The site is located within the coastal redwood region of Humboldt County, in a semi-rural area of Westhaven, California USA (T8N R1E SW1/4 Sec 31; elev. ca. 100 m) (Sundell and Norman 2003. Herpetol. Rev 33:4). The stumps were Redwood (*Sequoia sempervirens*) that were logged five decades ago. The forest canopy consisted of old-growth Sitka Spruce and second growth Redwood, with few Red Alder (*Alnus rubra*) and Cascara Buckthorn (*Rhamnus purshiana*) in the understory.

On 29 Jan 2001, two subadult female *E. eschscholtzii* intergrades were found on a Redwood stump (stump #1) covered with introduced English Ivy (*Hedera helix*) under a piece of Redwood bark in site 5. The stump was 6 m diam with Evergreen Huckleberry (*Vaccinium ovatum*) and spruce seedlings present on top of the stump ca. 1 m off the ground. The cover object measured 30 x 20 x 4 cm with a temperature of 11.4°C in the covered litter and English Ivy roots. The first female measured 7.3 cm TL and 3.6 cm SVL (measured to the anterior edge of cloaca), the other female measured 7.6 cm TL and 3.9 cm. SVL

On 16 Feb 2002, an *E. eschscholtzii* adult male intergrade (10.4 cm TL, 4.6 cm SVL) and a *B. attenuatus* were found 1.2 m off the ground on another redwood stump (stump #2), under litter, which was 8°C measured at a depth of 9 cm. The stump measured 5.2 m diam and was covered by False Lily-of-the-Valley (*Maianthemum dilatatum*) and two young spruce trees, which measured 4 cm in diameter.

On 2 Mar 2002, an adult male *E. eschscholtzii* intergrade (9.3 cm TL, 4.5 cm SVL) was found under litter on stump #2. This male was marked as LF2 RF2. The litter temperature was 7.3°C, which was measured at a depth of 9 cm. In addition, springtails, centipedes, and arachnids were located in the litter.

On 16 Mar 2002, an adult female, *E. eschscholtzii* (10.5 cm TL, 5.1 cm SVL) was found on another redwood stump (#3), 4.5 m diam. This salamander was wedged between pieces of outer bark, located 1.6 m off the ground.

The first stump was inspected again on 6 April 2002, and produced a female Rough Skinned-Newt (*Taricha granulosa*) (11.7 cm. TL, 4.7 cm SVL). The newt was found under the same piece of bark as the previous Ensatina salamanders found on top of stump #1. Also, present under the cover object with the newt was an adult *B. attenuatus*, which escaped capture.

On 16 Nov 2002, a subadult female *E. eschscholtzii* (7.6 cm TL, 4.1 cm SVL), was found under litter on stump #2, with a litter temperature of 10.8°C. Then again, on 25 Jan 2003, an adult male *E. eschscholtzii* (9.6 cm TL, 5.0 cm SVL), was found on the same stump, with a litter temp of 13.0°C. However, this was a recapture of the adult male (LF2RF2), first captured on 2 Mar 2002, on the same stump #2. Again, three more *B. attenuatus* juveniles were located under litter on top of the same stump. The litter had a temperature of 9.8°C at a depth of 9 cm.

On 15 Mar 2003, a subadult Wandering Salamander (*Aneides vagrans*) (7.4 cm TL, 4.1 cm SVL) was located on a Redwood stump (stump #4) with a subadult *B. attenuatus* (7.2 cm TL, 3.2 cm SVL), under a Redwood cover object 78 cm x 40 cm x 28 cm, which was located 1.5 m. above the forest floor. Stump #4 measured 3.1 m diam. The temperature in the interstitial space was 12.0°C.

Finally, on 29 Mar 2003, three more subadult *B. attenuatus* were located under litter on top of stump #2, which had a litter temperature of 11.7°C covering the coiled salamanders.

These observations emphasize the colonization of tree stumps by the terrestrial salamanders *E. eschscholtzii* and *B. attenuatus*, and the semi-aquatic salamander, *T. granulosa*, which are not known for their arboreal behavior. In addition, these observations might indicate additional areas that should be searched during salamander surveys to increase the number of individuals observed.

Bradford R. Norman and Thomas A. Kirk assisted with field observations. In addition, I thank the landowners, John and Carol Wiebe, for their support and enthusiasm for this project and permission to conduct observations on their property.

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EURYCEA BISLINEATA (Northern Two-lined Salamander). **LARVAL MICROHABITAT**. Published accounts of the microhabitat of *E. bislineata* larvae include hiding under small stones at the bottom of small pools in streams, under stones at the water's edge, under leaves and on the bottom in slow-moving pools in streams, on the bottom of a glacial lake, and in a small farm pond (Bahret 1996. J. Herpetol. 30:399–401; Brophy and Pauley 2001. Herpetol. Rev. 32:98–99; Dunn 1926. The Salamanders of the Family Plethodontidae. Smith Coll., Northampton, Massachusetts, 446 pp.; Hudson 1955. Herpetologica 11:202–204; Petranka 1998. Salamanders of the United States and Canada, Smithsonian Inst. Press, Washington, DC. 587 pp.). We have observed larvae under rocks in open water, among leaf litter in small pools in mountain streams, and along the stream edge in coarse, wet gravel. Use of living vegetation by these larvae has not been reported previously.

We surveyed a section of the Staunton River 10–500 m upstream from its confluence with the Rapidan River in Shenandoah National Park, Madison County, Virginia, on 20 August 2001 in an ongoing study of streamside salamanders. Until 27 June 1995 the Staunton River was a cool mountain stream with moss-covered rocks and boulders under a full forest canopy. A major rain event that day exceeding 60 cm in a 6-h period caused massive flooding and completely altered the structure of the stream and its surrounding environment (Smith et al. 1996. Water Res. Bull. 32:3099–3113). The stream was scoured several meters deep and the entire canopy, ground vegetation, and original substrate was lost. The open stream corridor was subsequently invaded by early colonizing vegetation such as Woolly Mullen (*Verbascum thapsus*) on the banks above the stream and Spotted Touch-me-not (*Impatiens capensis*) along the water's edge.

We observed an aggregation of ca. 50 *E. bislineata* larvae under and within a thick, filamentous root mass of a Spotted Touch-me-not at the stream edge. Root filaments were ~50 cm long and extended ~20 cm from the overhanging bank into the water in a stream pool. Larvae swam easily in and out of the root mass but were difficult to capture unless they were coaxed into free water. The small interstices among the root filaments appeared to provide adequate cover from syntopic predators such as Brook Trout (*Salvelinus fontinalis*) and salamanders (*Gyrinophilus porphyriticus*, *Desmognathus monticola*). Larval size (TL 21–41 mm, mean 27.2 + 4.5; N = 19) suggested they may have been a mix of one- and two-year old age classes (Petranka, *op cit.* and refs. therein). Ten other larvae captured in the stream that day were 25–59 mm TL. Larval *Eurycea* spp. might aggregate in microhabitats opportunistically that provide concealment. This might help to explain why they are captured in large numbers in leaf litter bags (e.g., Waldron et al. 2003. Applied Herpetol. 1:23–36).

Submitted by **JOSEPH C. MITCHELL**, Department of Biology, University of Richmond, Richmond, Virginia 23173, USA (e-mail: jmitchel@richmond.edu); and **WILLIAM BROWN**, Blue Ridge Biological, 978 Bull Yearling Road, Stanardsville, Virginia 22973, USA.

EURYCEA BISLINEATA (Northern Two-lined Salamander). **LARVAL SIZE.** Maximum larval size in this species varies geographically. Here we report on maximum larval size at the southern edge of the range of this salamander.

On 19 July 2003 we captured seven *E. bislineata* larvae in a small woodland stream on a steep slope within a portion of the Fredericksburg and Spotsylvania National Military Park (NPS) in the City of Fredericksburg, Virginia (30°18"28'N, 77°27"17'W). We assigned these larvae to *E. bislineata* based on the location of the site at the southern edge of its known range (Petranka 1998. Salamanders of the United States and Canada, Smithsonian Inst. Press, Washington, DC. 587 pp.; Mitchell and Reay 1999. Atlas of Amphibians and Reptiles in Virginia. Spec. Publ. No. 1, Virginia Dept. Game and Inland Fisheries, Richmond, Virginia. 122 pp.). The habitat was in mixed hardwoods near a heavily-traveled urban road adjacent to the floodplain of the Rappahannock River. Water temperature was 20ºC. The seven larvae ranged from 51–79 mm TL (29–43 mm SVL). One 74 mm TL individual had reduced gills, whereas the largest one and a 70 mm TL individual had large, filamentous gills. All three of the largest larvae had the dark lateral pattern typical of adult *E. bislineata* in this area (Fig. 1). The occurrence of such large larvae at the southern edge of its range suggests that larval periods of three years may not be limited to cold water environments in the north or that other factors may influence age and size at metamorphosis in this species.

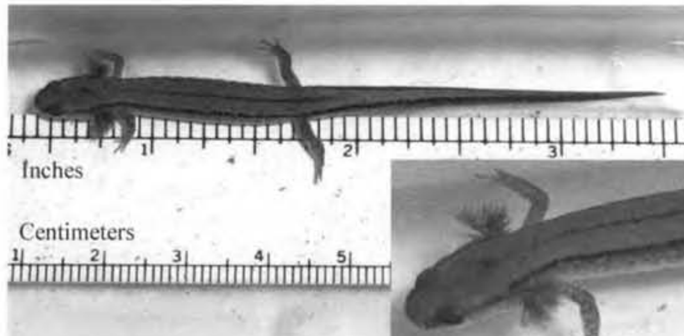

FIG. 1. *Eurycea bislineata* larva (79 mm total length) with large gills from Fredericksburg, Virginia. Photo by W. Brown.

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HEMIDACTYLIUM SCUTATUM (Four-toed Salamander) **NESTING ECOLOGY**. Little is known about the nesting ecology of *Hemidactylium scutatum* in Wisconsin (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Public Museum). During late May and early June 2002, we conducted surveys for nesting *H. scutatum* at three separate ponds at The Ridges Sanctuary and Toft Point State Natural Area (hereafter RS-TP) in Door County, Wisconsin, USA (T30N R28E Secs 3, 4, 9, 10, 15, 16, 17, 21, 22). Dominant woody vegetation surrounding the ponds included White Cedar (*Thuja occidentalis*), Paper Birch (*Betula papyrifera*), Tamarack (*Larix laricina*), Black Spruce (*Picea mariana*), Eastern Hemlock (*Tsuga canadensis*), and Speckled Alder (*Alnus rugosa*). Emergent vegetation within the ponds included Cattail (*Typha latifolia*), sedges (*Carex* sp.), and Marsh Marigold (*Caltha palustris*). All ponds had considerable moss (mostly *Sphagnum* sp.) growth along their perimeters.

The nest survey consisted of searching mosses, moss-covered islets, sedge mats, and fallen logs along the margins or within the ponds. Once a nest was located, we recorded the vertical position of the nest in relation to the water surface, the water depth (cm) below the nest, the snout–vent length (SVL) (mm), and total length (TL) (mm) of all females present, and the number of eggs. We classified nests into four categories based on the nest forms described by Breitenbach (1982. J. Herpetol. 341–346). Nest forms included: 1) solitary, 2) solitary with neighboring nests on the same islet, 3) double (eggs of no more than two females), and 4) multiple (eggs of three or more individuals). Solitary nests were defined as having no more than 40 eggs, all of which were the same stage of development. Double nests were defined as having between 41–79 eggs, whereas multiple nests were defined as having greater than 80 eggs. We considered double and multiple nests to be joint or communal.

Thirty *H. scutatum* nests were located within cavities in moss. No nests were located in sedge mats or decaying logs. Nests were positioned between 7–19 cm (mean 12.87, SD 3.81) above the water surface. Water depth below the nest ranged from 1.5–12 cm (mean 7.76, SD 3.28). Fifteen of the 30 nests had a female attendant at the time of discovery. No more than one female was found in any nest. Female SVL ranged from 33.26–43 mm (mean 36.46, SD 2.47 mm) and TL ranged from 65.66–94.96 mm (mean 84.49, SD 8.06 mm). The total number of eggs per nest ranged from 17–200 (mean 51.30, SD 37.02). Of the 30 nests found, the majority were classified as either solitary (40%) or double (37%). Four nests were solitary with neighboring nests on the same islet, and only three nests were considered multiple. The three multiple nests contained 100, 115, and 200 eggs and all lacked a female guardian. Approximately 46% of nests were considered joint.

Nest searches at RS-TP provided the first site examination of nesting *H. scutatum* in Wisconsin. The relative frequency of joint nesting during Spring 2002 at RS-TP was higher than most published accounts (Gilbert 1941. Copeia 1941:47; Wood 1953. Amer. Nat. 87:77–86; Harris and Gill 1980. Herpetologica 36:141–144.; Breitenbach 1982. J. Herpetol. 16:341–346), however Blanchard (1934. Copeia 1934:137–138) found 61% of nests in a Michigan population to be communal. This research was funded by The Ridges Sanctuary and Cofrin Center of Biodiversity, University of Wisconsin-Green Bay.

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HEMIDACTYLIUM SCUTATUM (Four-toed Salamander) **TERRESTRIAL MICROHABITAT.** Although *Hemidactylium scutatum* spends the majority of its life on the forest floor, few studies have focused on their terrestrial microhabitat preferences outside of the nesting season. Between August and late October 2001, we located *H. scutatum* during the day by searching 10 m^2 quadrats in a mature upland conifer forest at Toft Point State Natural Area in Door County, Wisconsin, USA (T30N R28E Sec 16). Each quadrat was searched for 15 min by both researchers and consisted of investigating cover objects (coarse woody debris, leaf litter, rocks, and decaying stumps). Once a specimen was found, we recorded the vertical position of the salamander (subsurface, surface under shelter, or exposed), the substrate immediately below the salamander (moss, soil, decaying wood, or leaf litter), and other amphibian species present within the quadrat.

Searches of 105 quadrats revealed the presence of 22 *H. scutatum*. Twelve (55%) were found on the surface under shelter, 8 (36%) were found beneath the soil surface, and only 2 (9%) were found exposed on the surface. Most subsurface encounters occurred when examining the contents of rotten stumps. The substrate directly beneath 10 (45%) salamanders was organic soil, decaying wood was found under 5 (23%), leaf litter under 4 (18%) and moss under 3 (14%). Other amphibians found during surveys included *Pseudacris crucifer*, *Rana sylvatica*, *Ambystoma laterale*, and *Plethodon cinereus*. The Chi-square test of independence (a = 0.05) revealed that *H. scutatum* was positively associated with all species except *Plethodon cinereus*. Our research supports the observations of Schaaf and Moore (1969. J. Herpetol. 3:180), Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Public Museum) and others, which suggest that *H. scutatum* spends its time outside the breeding season beneath cover objects on the forest floor or becomes fossorial. The Cofrin Center of Biodiversity, University of Wisconsin-Green Bay funded this research.

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ANURA

BUFO FOWLERI (Fowler's Toad). **PREDATION**. In Canada, *Bufo fowleri* occurs in three disjunct populations (Rondeau, Long Point, and the Eastern Basin, largely encompassed by Niagara County). This disjunct distribution and fluctuations in abundance have resulted in the Committee on the Status of Endangered Species (COSEWIC) listing *B. fowleri* as a Threatened species. As a Threatened species, knowing potential sources of predation is especially important. Here we report the predation of a juvenile *B. fowleri* by two Ring-Billed Gulls (*Larus delawarensis*) in James N. Allan Provincial Park, Ontario, Canada within the Niagara region (N42.848 W079.664).

During the late afternoon of 16 Aug 2003 while conducting a survey of toadlet abundance along the park beach, we observed a pair of Ring-billed Gulls on the beach pulling at a juvenile toad. When the gulls were disturbed, they flew out ca. 20 m into Lake Erie where the toad was dropped. The gulls landed beside the toad and swallowed it.

To our knowledge, this is the first reported predation of *B. fowleri* by gulls. Estimating the occurrence and sources of predation for such a threatened species has important conservation and management ramifications. We thank the Ontario Ministry of Natural Resources, and Ontario Parks for permission to conduct research and David Judd for his hospitality in the field.

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BUFO OCELLATUS (NCN). **DEATH FEIGNING**. Death feigning or thanatosis (Edmunds 1974. Defense in Animals. Longman, New York, 357 pp.), is a common behavior among frogs (Sazima 1974. J. Herpetol. 8:376–377; Duellman and Trueb 1986. Biology of Amphibians. McGraw-Hill, New York; Azevedo-Ramos 1995. Rev. Bras. Biol. 55:45–47). On 7 Aug 2003, in Unaí municipality (46°7'W, 16°9'S) when handling an adult male *Bufo ocellatus* (42.8 mm SVL), we observed death feigning behavior in this species. The specimen adopted a motionless posture, keeping his limbs close to the body and eyes closed. After 45 sec. in this position, the frog started moving, attempting to escape. However, when restrained it reinflated the lungs and released bladder liquid. Both behaviors are similar to those described for *B. paracnemis* (Zamprogno et al. 1998. Herpetol. Rev. 29:96–97) and probably are widespread among other species of this genus. The function of death feigning may be related to increasing the chances of being lost by a predator and/or to minimization injuries when seized by a predator (Sazima, *op. cit.*).

A voucher specimen (AAG-UFU 2484) is housed in the Museu of Biodiversidade do Cerrado, Universidade Federal de Uberlândia, Minas Gerais, Brazil. We thank Ariovaldo A. Giaretta for critically reading the manuscript and the owners of the Fazenda Sagres S. A. for logistic support.

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CHIASMOCLEIS VENTRIMACULATA and ***HAMPTOPHRYNE BOLIVIANA*** (NCN). **EFFECT OF PECCARY-HUNTING ON BREEDING HABITATS.** Anthropogenic influences on amphibian population declines can be categorized as direct habitat degradation and large-scale environmental changes (Blaustein et al. 1994. Conserv. Biol. 8:60–71; Dunson and Wyman 1992. J. Herpetol. 26:349–352; Fellers and Drost 1993. Biol. Conserv. 65:177–181; Harte and Hoffman 1989. Conserv. Biol. 3:149–158; Lind et al. 1996. Herpetol. Rev. 27:62–65).

The microhylid species *Chiasmocleis ventrimaculata*, *Ctenophryne geayi*, and *Hamptophryne boliviana* are sympatric throughout their western range, the Upper Amazon Basin of Ecuador and Peru. Since 1977, ecological data were gathered at the Peruvian Field Station Panguana where temporal blackwater ponds are typical spawning places for these species. At a large pond ca. 1200 m^2 spawning is coincident with an increase in precipitation followed by a short rainless period at the beginning of the rainy season. In addition to this pond there are small water-filled depressions, some of them muddy puddles used by collared and white-lipped peccaries (*Tayassu tajacu* and *T. pecari*) throughout the year. Like pigs, these peccaries are always moving in search of food and water, leaving the ground churned. They often return to the same mud wallows. Both species consume a wide range of food including fruit, roots, mushrooms, insects, snails; they occasionally feed on small vertebrates, e.g., lizards, snakes, frogs, and turtles. Their presence in a certain area is episodic and unpredictable. At Panguana *T. tajacu* is more common than *T. pecari* (Hutterer et al. 1995. Ecotropica 1:3–20).

These peccaries are eminent landscape architectures, increasing the diversity of aquatic plant and animal species. Anthropogenic influences on the herpetofauna of Panguana has been observed for a couple of years. One observation is the disappearance of many of the small temporary ponds, which can be caused directly by clearing woodlands or indirectly by hunting peccaries. Two of the small breeding ponds of *Hamptophryne boliviana*, *Chiasmocleis ventrimaculata*, and probably *Ctenophryne geayi* have disappeared. These ponds, known by the author since 1977, have formerly been puddles frequently used by peccaries. Since about 1992 footprints could not be found and the depressions gradually disappeared.

At the Río Pachitea and its confluence both peccaries are widely hunted, comprising a major part of daily proteins and skins (Redford and Robinson 1987. Am. Anthropol. 89:650–667). Detailed investigations are necessary to understand how this local hunting pressure depleting peccary populations affects amphibians and their reproduction. Similar studies will be necessary on tapirs (*Tapirus terrestris*) as amplecting pairs and egg clutches of *Hamptophryne boliviana* could be found in water-filled trails of peccaries and tapirs (Schlüter 1984. Doct. Dissert. Univ. Hamburg).

I thank the Instituto National de Recursos Naturales and Jesús H. Córdova (MHNSM) for their generous cooperation. Hans-Wilhelm Koepcke and his daughter Juliane Diller provided an opportunity to continue investigations on the herpetofauna of Panguana, and Gunther Köhler provided comments on the manuscript. Fieldwork was partly supported by the Förderverein of the SMNS and the Deutsche Forschungsgemeinschaft (DFG).

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COLOSTETHUS DEGRANVILLEI (Degranville's Rocket Frog). **REPRODUCTION**. While photographing *Colostethus degranvillei* in French Guyana, Cacao in a village 80 km from the capital Cayenne (4°33'32"N, 52°28'11"W), 500 m elev., 7 June 1999 (1415 h), we observed three small frogs on the back of an adult frog. When first observed we thought these were small tadpoles. The small frogs were dark brown with small blue dots. When disturbed, the small frogs would remain on the back of the parent. This suggests the tadpoles were normal, non-feeding larvae and they likely remained on the back of the male through metamorphosis. This area was very humid with normal temperatures around 30ºC this time of year, at the end of the rainy season.

This observation represents a new mode of reproduction not previously reported (Duellman and Trueb 1985. Biology of Amphibians. Johns Hopkins Univ. Press, Baltimore and London).

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LEPTODACTYLUS MYSTACINUS (Mustached Frog). **DEIMATIC BEHAVIOR**. Deimatic behavior is a mechanism of secondary defense, which has the function of increasing the possibility of survival of an animal after it has been detected by the predator (Robinson 1969. Evol. Biol. 3:225–259). This behavior has been described in Leptodactylidae, especially *Pleurodema* and *Physalaemus* (Martins 1989. J. Herpetol. 23:305–307 and references therein). However, little is known about its occurrence in the genus *Leptodactylus*. *Leptodactylus mystacinus* is broadly distributed in eastern Brazil (Frost 2002. Amphibians Species of the World: an online inference 2:21). Herein, I report deimatic behavior of *L. mystacinus* collected in Nanuque City, Minas Gerais State, southeastern Brazil, on 4 Nov 2001, during faunal rescue activities for Hidroeletric Usine of Santa Clara (UHE Santa Clara - 17°53'S, 40°11'W). This locality is an extension of the geographic distribution of this species and the first occurrence in the Mucuri River Basin. When collected, the specimen exhibited a defensive position similar to that of *Physalaemus nattereri*. The first stage consisted of inflating the lungs, followed by lowering of the back and suspending the posterior region of the body. During this display, the forelegs remained close to the body. This posture makes it difficult for capture by predators and allows the individual to use its head or legs for defense (Sazima and Caramaschi 1986, *op cit.*). The individual remained in this position for only a few seconds. When again threatened, the individual abandoned the deimatic behavior and fled, seeking shelter. This species lacks well-developed and conspicuous inguinal glands. Glandular secretions were not observed. This behavior has also been observed in *Physalaemus fuscomaculatus* and *P. deimaticus*, although its functional significance is not well understood. A voucher specimen is deposited in the Reference Herpetologics Collection of the Pontifícia Universidade Católica de Minas Gerais (MCNAM 2636).

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MERTENSIELLA LUSCHANI (Luschan's Salamander). **ENDOPARASITES.** *Mertensiella luschani* is a salamandrid that is known from the mountains of southeastern Anatolia, Turkey, and the Aegean islands of Karpathos, Saria, and Kasos (Frost [ed.] 1985. Amphibian Species of the World: A Taxonomic and Geographical Reference. Published as a joint Venture of Allen Press, Inc. and The Association of Systematics Collections, Lawrence, Kansas. 732 pp.). To our knowledge, there are no reports of helminths from *M. luschani.* The purpose of this note is to report two species of Nematoda from *M. luschani.*

Fifty *M. luschani* (mean SVL 141 mm ± 22 SD, range: 85–175 mm) were collected August 1997 and April 2001 in Antalya, Turkey (36°52'N, 30°45'E, elev. 150 m). Salamanders were preserved in 10% formalin and stored in 70% ethanol. The esophagus, stomach, and small and large intestines were opened and separately examined for helminths under a dissecting microscope. Nematodes were cleared in a drop of concentrated glycerol and studied as a temporary wet-mount under a compound microscope. Two species of Nematoda were identified: *Angiostoma aspersae* (from the small intestine) and *Cosmocerca longicauda* (from the large intestine). Prevalence (number of infected salamanders/salamander sample x 100) and mean intensity (mean number helminths per infected salamander ± 1 SD and range) were: *A. aspersae* (34%, 1.3 ± 0.77 SD, range: 1–4); *C. longicauda* (3.0 ± 2.0 SD, range: 1–7). Selected nematodes were deposited in the United States National Parasite Collection, Beltsville, Maryland as *A. asperase* (USNM 94459) and *C. longicauda* (USNM 94460). Voucher salamander specimens were deposited at Uludag University, Department of Biology, Bursa, Turkey.

Angiostoma aspersae was originally described from specimens taken from the snail *Helix aspersa* collected in France (Morand 1986. Bull. Mus. Nat. Hist. Nat, Paris, 4e sér., A 11:111–115). *Mertensiella luschani* is the first salamander species reported to harbor *A. aspersae*; but more work is necessary to determine if this nematode directly infects salamanders or is only a byproduct of diet. *Cosmocerca longicauda* has previously been reported from other European salamandrids: *Triturus alpestris, T. cristatus, T. helveticus, T. montandoni, T. vulgaris* (Baker 1987. Mem. Univ. Newfoundland, Occas. Pap. Biol. 11:1–325). It is apparently palearctic in distribution. *Angiostoma aspersae* and *Cosmocerca longicauda* in *M. luschari* are new host records; Turkey is a new locality record.

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PHYSALAEMUS BILIGONIGERUS (False-eyed Frog). **ENDOPORASITES.** Here we present data on helminths infecting *Physalaemus biligonigerus*. The study was carried out in a soybean cropland of the middle region of Argentina (31°14'46"S, 63°33'8"W, Córdoba Province) during December 2002 to March

2003. We collected 19 adult *P. biligonigerus* (7 males and 12 females; SVL 35–36 mm ± 1.96 mm).

All frogs were infected by helminths. The number of helminth species per individual host varied from 1–3 (most frequently three) and was not related to frog size (SVL, r = 0.22; p = 0.85). Three helminth species were recovered: one acanthocephalan, *Acantocephalus lutzi*, and two nematodes, *Rhabdias* sp., and *Physaloptera* sp. (found only as larvae cysts). Voucher specimens were deposited at the Faculty of Biochemistry and Biological Sciences Parasite Collection (FBCBPC 1000-3). Data on prevalence and infection intensities (*sensu* Bush et al. 1997. J. Parasitol. 83:575–583) for each helminth species and their respective sites of infection are given in Table 1. *Physalaemus biligonigerus* represents a new host record for *Acanthocephalus lutzi* and for the genera *Physaloptera* and *Rhabdias*.

Although the sample size is small, our data suggest that the population of *P. biligonigerus* that inhabited soybean cropland has a relatively high frequency of helminth infection, with the nematode *Physaloptera* being most prevalent. Stress, in the form of pesticide exposure, may decrease the host amphibians' ability to resist infection, resulting in higher parasite loads (Kiesecker 2002. Proc. Natl. Acad. Sci. 99:9901–9904). Despite the risk, anuran populations in the midwestern Córdoba Province coexist with soybean crops that are the dominant land use in this region. In addition, these anurans are exposed to pesticides used to protect these crops. Further studies are necessary to confirm the relationship between pesticide exposure and parasite infection.

We thank Graciela Navore and Mónika Hamann for suggestions.

TABLE 1. Prevalence (in percentage and absolute values) and intensity of infection (mean ± standard deviation, with range in parentheses) of helminths found in *Physalaemus biligonigerus* (N = 19).

	Helminth Prevalence	Mean intensity (range)	Site of infection
Acanthocephala			
Acanthocephalus lutzi	26.32% (5)	5 ± 3.5 (2–10)	Intestines
Nematoda			
Rhabdias sp	36.84% (7)	5 ± 3.8 (2–13)	Lungs
Physaloptera sp. (larvae)	84.21% (16)	28.7 ± 17.6 (3–50)	Stomach, cysts

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RANA BOYLII (Foothill Yellow-legged Frog). **PREDATION**. Introduced aquatic predators are known to negatively effect amphibian populations both directly and indirectly (Kats and Ferrer. 2003. Diversity and Distributions 9:99–110). The Signal Crayfish (*Pacifastacus leniusculus*) is native to the Pacific Northwest and has been introduced into numerous Sierra Nevada drainages which are currently populated by *R. boylii* including the Pit, Stanislaus, South Fork Trinity (Jamie Bettaso, pers. comm.), and the North Fork Feather rivers. Failed recruitment at several *R. boylii* breeding sites on the Pit River led to speculation about possible negative impacts of the signal crayfish on *Rana boylii* populations (Pacific Gas and Electric Company, unpubl. data).

In conjunction with visual encounter surveys on the regulated Cresta Reach of the North Fork Feather River (Butte Co., California), we installed an Aqua Vu® underwater video camera system to monitor *R. boylii* egg masses and tadpole groups.

Analysis of over 92 hours of videotape revealed several predation events upon a *R. boylii* egg mass. On 23 June 2003 at 1819 h an adult *P. leniusculus* was observed feeding on a *R. boylii* egg mass (depth 21 cm; water temp 16ºC; distance from shore 80 cm; 0636000 N, 4410200 E; NAD 27, Zone 10; 427 m elev.). During this observation the crayfish exhibited defensive behavior when another adult crayfish approached and appeared to initiate feeding, and was successfully driven off. Periodic feeding continued by the defending crayfish (entire event lasted 19.2 minutes; video verified by L. Kats), and recently hatched larvae were observed fleeing the egg mass during feeding. *Pacifasticus leniusculus* was commonly observed near egg masses and tadpole groups during video monitoring in both diurnal and nocturnal conditions.

During visual encounter surveys, we noted at least three observations of larvae with tail injuries suggestive of predation attempts by crayfish (injuries resembled clean, scissors-like cuts). Larval tail injuries have also been noted by other biologists working on the Poe Reach of the North Fork Feather River (A. Pool, pers. comm.). These observations are consistent with studies showing that Signal Crayfish are adept at consuming anuran larvae using their claws and walking legs, with unsuccessful prey handling resulting in tail loss (Axelsson et al. 1997. Amphibia-Reptilia 18:217–228). Our observations of Signal Crayfish depredating and molesting *R. boylii* egg masses suggest that they might also contribute to the dislodging of egg masses, leaving them vulnerable to further losses associated with river flow fluctuations.

We also observed a predation attempt upon a *R. boylii* larva. On 27 June 2003 at 2059 h an undetermined species of young-of-the-year fish (ca. cyprinid) attempted to consume a recently-hatched *R. boylii* larva (depth 18 cm; water temp. ca. 14ºC; distance from shore 160 cm; 0636281 N, 4411255 E; NAD 27, Zone 10; 427 m elev.). The outcome of this observation remains uncertain because of low light conditions and unclear movements of the larva after the fish captured it in its mouth. During this observation other young-of-the-year fish were observed pecking the substrate in the area where several hundred recently-hatched *R. boylii* larvae were located.

Studies conducted in Europe showed that the presence of exotic *P. leniusculus* caused tail injuries, decreased metamporph size and survivorship of *Rana temporaria* (Nyström et al. 2001. Ecology 82:1023–1039). Recent work conducted in the Sierra Nevada has demonstrated that *P. leniusculus* is more likely to be found in close proximity to reservoirs and in regulated vs. unregulated systems (Light 2003. Freshwater Biol. 48:1886–1897). Preliminary analysis of 328 historical *R. boylii* localities within the entire range shows that 90 (27.4%) of the localities have a dam of any size upstream and 67 (20.4%) have at least one large dam (>15 m high) upstream (A. Lind, unpubl. data). These data suggests that a significant proportion of *R. boylii* populations may be vulnerable to impacts caused by introduced Signal Crayfish. Recent observations by Rombough and Hayes (2005. Herpetol. Rev. 36:163–164) describe Signal Crayfish preying upon the embryos of *R. boylii* within the natural range of the crayfish. This indicates that historically, northern populations of this frog have had some experience with crayfish predators.

Further studies should address: 1) other possible indirect effects of *P. leniusculus* on *R. boylii* populations such as changes in larval behavior, development, and survivorship, 2) the extent of Signal Crayfish distribution within the range of *R. boylii*.

A condensed version of the video clip can be viewed at: http://www.garciaandassociates.com/sanfran.htm. We thank Pacific Gas and Electric Company biologists A. Pool, C. Seltenrich, W. Roberts, C. Herrala, and M. Carbiener for helpful advice and assistance under the FERC 1962 project; J. Minton for assistance with field work and camera system configuration; L. Kats for review of video; A. Lind for helpful advice and information.

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RANA BOYLII (Foothill Yellow-legged Frog). **PREDATION: EGGS AND HATCHLINGS**. Direct observations of predation on eggs and embryos of North American ranid frogs exist (Chivers et al. 2003. Oikos 92:135–142; Evenden 1948. Copeia 1948:219–220; Rathbun 1998. Herpetol. Rev. 29:165; Saenz et al. 2003. Copeia 2003:646–649), but the typical brevity of such events often results in inferring their occurrence (e.g., Howard 1978. Ecology 59:789–798; Van Wagner 1996. Selected Life History and Ecological Aspects of a Population of Foothill Yellow-legged Frogs (*Rana boylii*) from Clear Creek, Nevada City, California. MSc Thesis, California State University, Chico, California. 143 pp.). Further, smaller size and poorly developed predator-evasion ability make hatchling ranid frog larvae vulnerable to a larger predator set than older larvae (Licht, *op. cit.*). Despite this larger array of predators, hatchling mortality, like egg mortality, is also often inferred, typically from a rapid decline in numbers during the immediate post-hatching period (e.g., Calef 1973. Ecology 54:741–758; Licht 1974. Can. J. Zool. 52:613–627). Such data underscore the belief that aquatic larvae sustain the greatest mortality among ranid frog life stages (e.g., Calef, *op. cit.*; Cecil and Just 1979. Copeia 1979:447–453; Herreid and Kinney 1966. Ecology 47:1039–1040; Licht, *op. cit.*). For these reasons, we provide direct observations of predation on both the eggs and hatchling larvae of *Rana boylii* from Oregon, USA.

During a survey of *R. boylii* oviposition sites during 16–30 May 1997, one of us (MPH) made observations of egg predation at two different sites along the South Umpqua River east of Tiller (Douglas Co., Oregon). At the first site, 9 *R. boylii* egg masses were located on a bedrock shelf in shallow (< 25 cm) water, and were attached to both the downstream side of cobbles or boulders (N = 6) and to the margin of a flow-protected bedrock crease (N = 3). Flow velocities adjacent to egg masses were 0.5–0.8 m/sec. An adult (ca. 100–110 mm TL) Signal Crayfish (*Pacifastacus leniusculus*), native regionally, was seen next to each of two of these egg masses. At one egg mass, MPH observed a crayfish use its mouthparts and anterior walking legs to manipulate a 3-cm lobe of the egg mass gently oscillating in the current about 4 cm above the substrate. Over a 10-min interval, the crayfish removed and ate three embryos (ca. Gosner Stage 11) before being attracted to detritus drifting nearby. Examination of the area where the crayfish had fed revealed five torn egg capsules, four with missing embryos and one with a 1-mm fragment of an embryo. A second adult crayfish was first observed moving over the substrate near one of the egg masses in the bedrock crease. When the crayfish, approaching from downstream, got within 10 cm of the mass, it changed direction, moved directly to the egg mass and began to pull at an elongate, partly torn lobe. In less than a minute, the crayfish had torn off a piece of the lobe containing 15–20 eggs and retreated into the bedrock crease, where it continued to pick at and tear the jelly with its walking legs. Six embryos were seen removed from the jelly over a 20-min period before observations were discontinued. Although most was discarded, the crayfish also consumed some capsular jelly. At the second site, five *R. boylii* egg masses were seen attached to bedrock near the base of a 0.5-m cascade; flow velocities near the egg masses were 0.7–1.1 m/sec. During examination of these masses, MPH observed another crayfish move upwards through a 3–4 cm crease in the bedrock partly covered by two of the egg masses, both with embryos in tail bud stage (Gosner Stage 17). The crayfish moved into a semi-concealed position between the egg masses and proceeded to pull at the jelly of the lower mass with its anterior walking legs. During 35 min of observation, the crayfish opened eight capsules, successfully extracting seven embryos, and was still picking at the jelly when observations were discontinued.

In the course of a study of *R. boylii* during 2000–2003, CJR made a series of observations along the South Santiam River, 10 km E of Sweet Home (Linn Co. Oregon; 44°25'N, 122°34'W; elev. 192 m). Site geology is distinctive; erodable conglomerates within hard competent tuffs result in a relatively flat bedrock surface scoured bare of almost all loose rock < 0.5 m in diameter and within which exists a series of troughs and scour pools holding mostly smaller cobble and gravel. All observations occurred during the interval after oviposition (June–early July), when river width is 100–120 m and water depth at marginally located oviposition sites is ca. 30 cm.

On 27 June 2000, a 30-mm (total length) pebble-case caddisfly larva (*Dicosmoecus gilvipes*) was observed crawling on the surface of a *R. boylii* mass (Gosner stage 14). The caddisfly was seen to grasp each capsule with its legs, turn it over and repeatedly probe into the jelly with its mandibles. During this manipulation of at least four different eggs, CJR saw the larva thrust its mandibles through the jelly, reach the embryo, and chew it for a few seconds before withdrawing its head from the capsule. The caddisfly larva reached four embryos, but it ate less than one-third of the most-chewed embryo during 5 min of observation. On 4

June 2003, a similar-sized *D. gilvipes* larva was observed burrowing through the jelly of a *R. boylii* egg mass (Gosner Stage 11) using its legs and mandibles. In contrast to the aforementioned larva, this larva chewed a path directly toward an embryo. On reaching the embryo, it consumed the embryo entirely, leaving an empty capsule and then moved to another egg. In ca. 5 min, the *D. gilvipes* larva had eaten at least three embryos. On seven other occasions, similar-sized *D. gilvipes* larvae were seen probing the surface of *R. boylii* egg masses with their mandibles; in one instance, a larva was observed with a *Rana boylii* egg mass fragment containing 50 embryos attached to its pebble case.

During 8 min of observation on 11 July 2000, seven (five ca. 60 mm fork length (FL) and two ca. 20 mm FL) Speckled Dace (*Rhinichthys osculus*) and one Reticulate Sculpin (*Cottus perplexus*; ca. 60 mm FL) were observed picking *R. boylii* hatchlings (Gosner Stage 20) from the surface of an egg mass and nearby cobble substrate. The mass, in a 30-cm deep pool with low flow (< 1 m/sec), had an indirect connection (> 20 cm depth) to the river. The larger fish typically swallowed *R. boylii* hatchlings whole, one plucking several larvae from within the jelly, but the two smaller dace only picked at the hatchlings. On the same date, ca. 50 m upstream, CJR observed another mixed-species group of 15 cyprinid fishes (including dace, Northern Pikeminnow [*Ptychocheilus oregonensis*], and Redside Shiner [*Richardsonius balteatus*]), all ca. 60 mm FL, capturing hatchling *R. boylii* (Gosner Stage 22) larvae in a similar manner around three egg masses in a shallow (ca. 8 cm deep) pool with a ca. 10 cm deep connection to the river. A school of > 100 smaller (10–15 mm FL) cyprinid fry were also in the pool, but were not seen attempting to prey on *R. boylii* larvae.

On 6 June 2003, CJR observed five (40 mm FL) dace and a sculpin (80 mm FL) feeding on the eggs and jelly of a recently laid (Gosner Stage 4) *R. boylii* egg mass in water 19 cm deep. Predatory behavior was similar to the previous accounts, except that both the dace and sculpin picked off and consumed bits of jelly in addition to eating any embryos that became exposed. Several embryos and some of the surrounding jelly were eaten in this manner over 4 min of observation.

On 12 June 2003, CJR observed a mixed-species school of about 60 (30–50 mm FL) cyprinid fishes (mostly dace, but also Northern Pikeminnow and Redside Shiner) feeding on the aging jelly of an *R. boylii* egg mass and its (Gosner Stage 20) hatchling larvae. The ca. 20 cm deep pool in which this egg mass was located was almost completely disconnected from the active channel. Many larvae had emerged from the mass; these larvae both clung to the sides of the mass and settled into interstitial spaces in the surrounding cobble, from which the fish were picking them. At least 10 *R. boylii* hatchlings were consumed during 10 min of observation.

In addition to these observations of predation, all four fish species described herein were documented in *R. boylii* oviposition pools on > 11 other occasions (at least one of which involved direct predation of *R. boylii* embryos) when *R. boylii* egg masses were present.

Previous to our observations, the only published report of unambiguous predation on eggs of *R. boylii* is that of Evenden (*op. cit.*), who removed eggs from the stomachs of some of 35 Rough-skinned Newts, *Taricha* [as *Triturus*] *granulosa*, from the South Santiam River (Oregon). Wiseman et al. (2005. Herpetol. Rev. 36:162–163) also documented Signal Crayfish predation of *R. boylii* eggs from within the introduced range of this crayfish in northern California. In contrast, no previous reports of hatchling predation exist.

Oregon Department of Fish and Wildlife provided funding for CJR, and the US Forest Service provided logistic support for CJR and funding for MPH; this work represents a contribution from the Science Division of the Habitat Program of the Washington Department of Fish and Wildlife. Permits to handle *R. boylii* were issued by the Oregon Department of Fish and Wildlife.

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RANA BOYLII **(Foothill Yellow-legged Frog). PHYSIOLOGICAL SKIN COLOR TRANSFORMATION.** Color change as well as lightening and darkening of skin tones have been documented in several anurans (King et al. 1994. Copeia 1994:422–432; King and King 1991. Can. J. Zool. 69:1963–1968). Nussbaum et al. (1983. Amphibians and Reptiles of the Pacific Northwest. Univ. Idaho Press, Moscow, Idaho. 332 pp.) reported that individual *Rana boylii* are capable of lightening and darkening, however, we are unaware of any detailed documentation of this phenomenon in this species. The anuran dermis layer contains three types of chromatophores that may be responsible for pigment change: iridophores, xanthophores, and melanophores. Melanophores are the pigment cells responsible for lightening and darkening of the skin. This skin tone change is the most common color transformation documented in anurans. Here we report a field observation of skin color transformation in *R. boylii*. *Rana boylii* is a stream-breeding frog that reputedly dwells almost exclusively along running waters where it is associated with both in-stream and stream margin habitats. However, we often find frogs on adjacent uplands such as gravel bars and moist vegetated areas within the floodplain (unpubl. data). *Rana boylii* are heliotherms that thermoregulate by basking on heated surfaces such as sun-warmed rocks. On 16 Oct 2003 at ca 1040 h during a survey on Hurdygurdy Creek, Del Norte County, California, USA, we captured an adult female *R. boylii* (52 mm SUL) on an upland floodplain area 5.5 m from the wetted edge. The primary substrate was cobble and recent rains had produced a newly fallen moist leaf litter layer. The frog was found sitting in a shady spot on top of yellowish leaf litter. We measured, weighed, and pit-tagged the frog and took a photo of the ventral side of the frog's chin (Fig. 1). We have been routinely collecting photos of frog chins to determine if the mottling patterns on their chins can be used to identify individual frogs. In addition, we took a full body photo because this frog had a very distinct, nearly white, pale tan color (Fig. 1). *Rana boylii* dorsal skin coloration can be highly variable (light gray, olive green, brown, brick red); however, of 196 captured and marked adult frogs (>40 mm SUL) at our study site over the last two years, this particular frog was noticeably lighter in color than any other we

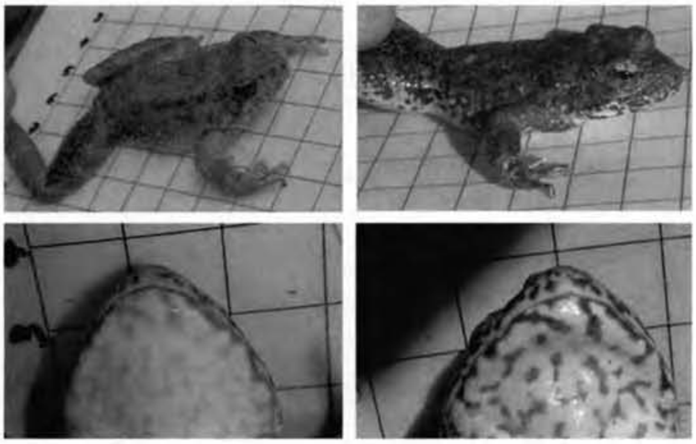

FIG. 1. Dorsal body and ventral side chin photos of the captured *Rana boylii*. Photos in the left column were taken at initial capture (1040 h). Photos in the right column were taken at second capture (1300 h).

have captured. Her chin mottling was very faded as well.

At ca. 1300 h when returning from the completed survey we captured an adult female frog ca 2.5 m from the location of the previously mentioned frog. The frog was sitting in a shallow silt-bottomed puddle surrounded by dark colored cobbles on the same upland floodplain area. Because this frog was nearly black in color, we initially assumed it to be a new capture. Upon closer inspection, the frog was newly pit-tagged and upon reading the pit-tag we discovered it was the same frog captured earlier in the survey. We immediately re-photographed her full body and chin (Fig. 1), and took additional photos 15 min and 1.5 h later when both body color and chin mottling color were subsequently paler, although not as pale as the initial capture. Our observations indicate that *Rana boylii* can undergo relatively rapid color transformations, changing from light to dark shades and back to light shades. The cue that prompts this color darkening and lightening and the function of the change is unknown. Because of the numerous variables between captures of this individual (background substrate, photoperiod, temperature, time since disturbance), we cannot speculate on the stimuli or the function of the observed changes.

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RANA CASCADAE (Cascades Frog). **PREDATION.** Many potential predators of *Rana cascadae* have been reported, however no studies have actually documented predation by the garter snakes, *Thamnophis atratus* and *T. sirtalis*. During a radio telemetry study of *R. cascadae* within the Trinity Alps Wilderness, Trinity County, California, USA, we confirmed predation on three adult *R. cascadae* and suspect another by these garter snakes.

On 23 June 2003 we palped a radio-tagged adult male *R. cascadae* (22.5 g, 58 mm SUL) that had been tracked for the previous 3 days from an adult *T. atratus* (850 mm TL). On 12 Aug 2003 we palped a radio-tagged adult female *R. cascadae* (30.7 g, 71 mm SUL) that had been tracked for the previous 26 days from an adult *T. sirtalis* (720 mm TL). On 25 Aug 2003 we palped a radio-tagged adult female *R. cascadae* (24.5 g, 61 mm SUL) that had been tracked for the previous three days from an adult *T. sirtalis* (700 mm TL). From 1–5 Sept 2003, out of five tracking attempts, we could not visually locate a radio-tagged female *R. cascadae* (22.3 g, 58.9 mm SUL) that had been tracked for the previous 25 days. Strong signals were coming from terrestrial bank burrows ca. 2 m from water. Subsequently, on 07 Sept 2003 we found the transmitter along with its attachment ribbon, both were coated with a slimy film. It is likely this individual was also eaten by an adult *Thamnophis* sp. All three confirmed predation events occurred near lentic water bodies, where *R. cascadae* reproduction was documented in 2003 (J. Garwood, unpubl. data). On 23 Sept 2003 we observed an adult *T. sirtalis* capturing and eating *R. cascadae* tadpoles by herding groups of them into small shallow alcoves of a pond. On 13 Oct 2003 we observed a subadult *T. sirtalis* (ca. 450 mm TL) probing its head into cracked mud interstitial areas at a dry pond. The interstitials within the mud contained hundreds of recently metamorphosed *R. cascadae* and *Hyla regilla* taking refuge. We observed one predation event of a post-metamorphic *R. cascadae* by this snake.

These observations of predation document that *T. atratus* and *T. sirtalis* prey on larval, metamorph, and adult *R. cascadae*. These snakes were seen regularly during our telemetry study and we suspect they are a major predator of *R. cascadae*.

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SCAPHIOPUS COUCHII (Couch's Spadefoot). **ENDOPARASITES.** Previous reports of endoparasites in *S. couchii* are the monogenean *Pseudodiplorchis americanus* (Tinsley and Earle 1983. Parasitology 86:501–517), the cestode *Distoichometra bufonis* and the nematodes *Aplectana incerta*, *A. itzocanensis*, and *Oswaldocruzia pipiens* (Goldberg and Bursey 1991. J. Helminthol. Soc. Washington 58:142–146; Tinsley 1990. Am. Zool. 30:313–324), all reported from Arizona. The purpose of this note is to report a new host record and new locality records for helminths in *S. couchii*.

Fourteen *S. couchii* (mean SVL 44.6 mm ± 12.2 SD, range: 27–60 mm) were collected from Cochise County, Arizona in 1972 (N = 10) or Pima County, Arizona in 1971 (N = 4). Eight *S. couchii* (SVL 50.3 mm ± 11.4 SD, range: 28–64 mm) were collected in Hidalgo County, New Mexico in 1972. Spadefoots were deposited in the Museum of Zoology, University of Michigan, Ann Arbor as UMMZ 230124–230137 (Arizona) and UMMZ 230138–230145 (New Mexico). The esophagus, stomach, small and large intestines, lungs, and urinary bladder were opened and separately examined for helminths under a dissecting microscope. The body cavity was also examined for helminths. Monogeneans and cestodes were regressively stained in hematoxylin and studied as whole-mounts; nematodes were cleared in a drop of concentrated glycerol and studied as wet mounts.

Found from Arizona were one species of Monogenea *P. americanus* (urinary bladder) (prevalence: number infected spadefoots/sample examined x 100 = 7%, mean intensity ± 1 SD: mean number helminths per infected spadefoot and range = 1.0), two species of Cestoda *D. bufonis* (prevalence 29%, mean intensity 6.3 ± 5.0, 1–11) and *Nematotaenia dispar* (both small intestines; prevalence 14%, mean intensity 12.0 ± 5.7, 8–16) and two species of Nematoda *A. incerta* (prevalence 36%, mean intensity 100.8 ± 122.4, 2–305) and *A. itzocanensis* (prevalence 14%, mean intensity 46.5 ± 62.9, 2–91; both large intestines). Found from New Mexico were *P. americanus* (prevalence 38%, mean intensity 1.0) and *A. incerta* (prevalence 38%, mean intensity 62.0 ± 48.3, 23–116). Helminths were deposited in the United States National Parasite Collection (USNPC), Beltsville, Maryland as: Arizona, *Aplectana incerta* (94447), *A. itzocanensis* (94448), *Distoichometra bufonis* (94445), *Nematotaenia dispar* (94446), *Pseudodiplorchis americanus* (94444); New Mexico, *A. incerta* (94451), *P. americanus* (94449–50).

Kuntz (1941. Proc. Oklahoma Acad. Sci.21:33–34) reported two species of cestodes from *S. couchii* but did not designate which species they were. *Nematotaenia dispar* is a new host record for *S. couchii;* New Mexico is a new locality record. *Pseudodiplorchis americanus* from New Mexico is a new locality record.

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TESTUDINES

CARETTA CARETTA (Loggerhead Seaturtle). **PREDATION.** Documenting predation on hatchling seaturtles is important for population demographers when developing research and conservation strategies. Hatchling predation by crabs, raccoons, and other terrestrial species are well known. Unfortunately, most marine predators are seldom identified to species and are lumped into groups such as sharks and fish (Stancyk 1995. Biology and Conservation of Sea Turtles. Smithsonian Institution Press, pp. 139–152). Establishing the identity of fish species that consume *Caretta caretta* hatchlings off the southeastern coast of the United States is difficult because the turtles emerge and enter the surf at night, and determining the magnitude of the nocturnal predation is even more challenging. Stewart and Wyneken (2004. Bull. Mar. Sci. 74:325–335) produced the first study to address nearshore hatchling predation in the southeastern U.S. They reported tarpon (*Megalops atlanticus*) and catfish (*Arius felis*) as the major identified nearshore predators of hatchling Loggerheads (four each) at Juno Beach, Florida, as well as several unknown predators.

On 20 July 1998, a fishery observer aboard a shark gillnet boat 22.2 km NE of Cape Canaveral, Florida took photos of a crew member cleaning the catch of Atlantic Sharpnose Sharks (*Rhizoprionodon terraenovae*). The observer noted that several hatchling Loggerhead Seaturtles had been recently consumed in the three shark stomachs cut open. The three sharks had two hatchlings each. Unfortunately, because of the large number of sharks on board, no more stomachs were cut open because the sharks were being processed for market. These are small (< 80 cm), abundant sharks and frequently school near the Loggerhead nesting beaches in summer months (Dodrill 1977. Ph.D. dissertation. Florida Inst. Technol., Melbourne. 304 pp.). These sharks also occur further offshore near the edge of the Gulf Stream, where surface downwelling and strong northerly currents concentrate hatchling turtles in lines of *Sargassum* weed (Witherington 2002. Mar. Biol. 140:843–853). Earlier, Witham (1974. Copeia 1974:548) reported eight hatchling Loggerhead Seaturtles and one Green Seaturtle (*Chelonia mydas*) from the stomach of a dolphin fish (*Coryphaena hippurus*) captured near a patch of floating *Sargassum* weed 19 km E of the nesting beach at St. Lucie Inlet.

Stewart and Wyneken (*op. cit.*) felt that the nearshore predation rate was probably higher than the offshore predation rate because the predators are (hypothetically) concentrated on the reef line. However, the hatchlings are only subjected to a short period (ca. 15 min) of exposure as they move from the beach to deeper water at night. It is possible, however, that the predation rate in deeper water may be significantly higher than the nearshore predation rate because the *Sargassum* weed lines concentrate hatchlings into a narrow nektonic buffet for dolphin fish and sharpnose sharks for months.

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GLYPTEMYS INSCULPTA (Wood Turtle). **JUVENILE MOVEMENTS AND HOME RANGE.** Here we report movements and home ranges of two juvenile *Glyptemys insculpta* in southern New Hampshire, including the longest-distance movements from streams reported for the species. Thirty-six juveniles (lacking secondary sexual characteristics as described by Harding and Bloomer [1979. Bull. New York Herpetol. Soc. 15:9–26]) were hand-captured and marked by marginal scute notching; age estimates were determined by counting growth annuli on the right abdominal scute. Age-0 hatchlings (N = 54) that emerged during the study period were not included as juveniles. Two juveniles, one from each of two convergent streams (Stream A, Stream B), were fitted with 18-g radio transmitters and located throughout the active season every other day from 8 April 1993 to 30 May 1994 (N = 66, N = 77 recaptures per turtle). Methods used for determining home ranges follow Tuttle and Carroll (2003. Chelonian Cons. Biol. 4:656–663).

An additional 34 juveniles (mean CL = 96.9 ± 34.4, range = 34.9–154.7 mm; mean number of annuli = 5.9 ± 3.8, range = 1–15; measurements are ± 1 SD) captured that were not affixed with radio transmitters were found either in a stream (N = 5) or within 70 m of a stream (mean = 15.7 ± 23.4 m, N = 29). Among younger age classes, first-year juveniles hatched in 1992 (N = 6) were found within 1.8 m of the water in dense vegetation bordering a stream; all 2-yr-old juveniles (N = 4) were found within 10 m of a stream.

Radio-tagged Juvenile #1 (CL = 143 mm, mass = 490 g, annuli = 11) occupied a small home range (0.7 ha, as calculated by the convex polygon method) in an area that included Stream B and the sloping edge of a hayfield that was located 60 m from the stream and that was separated from the stream by alder swamp habitat and a dirt road. The juvenile traveled back and forth between the hayfield bank and the stream throughout the active season. Usually the turtle was found in dense grass cover or cryptically basking on top of the flattened grass where the height of the surrounding vegetation provided the turtle with cover. This juvenile entered hibernation on 4 October in water ca. 0.6 m in deep, within a few meters of its capture location on the stream bottom on 8 April.

Radio-tagged Juvenile #2 (CL = 122 mm, mass = 280 g, annuli = 8) had a convex polygon home range size of 27.6 h, which was comparable to the mean size of adult male home ranges (23.9 ha) in this population (Tuttle and Carroll 2003, *op. cit.*). Until 4 July, the turtle remained in or near Stream A most of the time, although it traveled long distances in the stream. Twice it was found on the edge of a hayfield ca. 150 m from water. By 9 July, Juvenile #2 had moved 0.5 km from the stream to its terrestrial summer range located in upland mixed forest where it was most often found hidden in piles of slash or dense successional vegetation at a crossroads of previously-used logging trails. During this period the turtle traveled as far as 865 m from the stream. Although Juvenile #2 returned to Stream A on 29 August, it did not enter hibernation until 19 October.

There was a 39-fold difference in convex polygon-calculated home range size between the two juveniles. Stream A was bordered by a large expanse of upland forest with a sparsely vegetated herbaceous layer. Suitable summer habitat that included disturbed areas near logging road junctions were located at much longer distances from Stream A. Conversely, Juvenile #1 had sufficient cover located within close proximity of Stream B. In contrast to Stream A, Stream B was bordered by 75% more alder swamp habitat containing rich organic soils where adult Wood Turtles were observed to forage for earthworms. Home ranges for adults along Stream B were generally smaller and more linear in shape, with the turtles remaining closer to the stream (Tuttle and Carroll 2003, *op. cit.*). Home ranges of telemetered juveniles from each of the two streams in our study fit a similar spatial pattern.

These data show that juvenile *G. insculpta* can occupy home ranges as large as 27.6 ha and use summer habitat as far as 865 m from a stream. Our results augment previously recorded movements and home range observations of *G. insculpta* and indicate that potentially long terrestrial movements and access to cover should be considered when planning conservation and management strategies for this species.

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GLYPTEMYS (CLEMMYS) MUHLENBERGII (Bog Turtle). **PREDATION.** On 27 April 1986, during a study of a population of *Glyptemys muhlenbergii* in Sussex County New Jersey, USA, a predated and empty shell of *G. muhlenbergii* was located. On 23 September 1986 three additional predated, and empty, *G. muhlenbergii* shells were located, and one of the Common Snapping Turtle, *Chelydra serpentina*; all appeared to be fresh kills. Descriptions of the chelonians follow: *G. muhlenbergii*: 11 year old female SCL = 83 mm, plastron intact, head and limbs missing, heavy chew marks on anterior portion of carapace and plastron; 9-year old female SCL = 87 mm, plastron intact, head and limbs missing; 12-year old female SCL = 78 mm, plastron intact, head and limbs missing; 4-year old female SCL = 58 mm cracked carapace only, plastron missing. *Chelydra s. serpentina*: SCL = 71mm carapace only, plastron missing.

The four *G. muhlenbergii* represented 13.8% of the known population at that time. The habitat consists of a two hectare cow pasture crossed by intermittent small streams. All shells were located on the edges of these streams within one meter of waters edge. The predators had located the chelonians by rolling back mats of *Sphagnum* sp. and leaving the chelonians exposed. Numerous tracks of the Raccoon, *Procyon lotor*, were observed around each of the predated shells. The tracks were followed back to a brush pile, measuring seven meters in diameter and three meters high, of cut saplings of Red Maple, *Acer rubrum*, and Alder, *Alnus* sp., that the farmer had cut from the wetland and piled prior to removal from the area. Inspection of the brush pile located two sub-adult Raccoons, which were suspected to be the predators of the chelonians. This report should warn land managers and habitat rehabilitators against piling cuttings of cleared debris, even temporarily, which might create shelter for potential predators.

All shells have been deposited in the New Jersey State Museum: accession number MH2003.20. This study was performed under permit from The State of New Jersey dated 31 March 1986.

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KINOSTERNON SONORIENSE (Sonoran Mud Turtle). **DIET**. Hulse (1974. J. Herpetol. 8:195–199) concluded from an examination of stomach contents that *Kinosternon sonoriense* was an opportunistic carnivore that fed mainly on invertebrates, though plants, fish, and ranid frogs were occasionally eaten. Ligon and Stone (2003. Herpetol. Rev. 34:241–242) reported two observations of *K. sonoriense* feeding on adult *Bufo punctatus*. Here, we add a reptile and a bird to the list of dietary items consumed by *K. sonoriense*. Both observations were made in small pools in the Peloncillo Mountains, Hidalgo Co., New Mexico (USA), in the same canyon as the observations reported by Ligon and Stone (*op. cit.*).

On 7 August 2004, at ca. 1000 h, we observed an adult female *K. sonoriense* (101.7 mm midline carapace length [MCL], 151 g) capture and kill a Black-necked Gartersnake (*Thamnophis cyrtopsis*, 348 mm SVL, 23.3 g). The observation began when we noticed splashing in a pool (ca. 12 m^2 area, ca. 10 cm deep) beside the trail. When first observed, the turtle's jaws held the snake by the neck, ca. 10 cm behind the snake's head. During the first 10 sec. of the encounter, the snake attempted to bite the turtle on the carapace at least twice. Within two minutes, the snake was dead and the turtle was eating the snake. At this point the turtle seemed to notice us and released the snake, moving away from us, toward the edge of the pool. We then captured and measured the turtle and collected the snake. The skin had been stripped off the dead snake from the point where the turtle had grasped the snake forward to the head, and there was a large piece of neck muscle missing. We released the turtle and deposited the snake in the University of Central Oklahoma Collection of Vertebrates (UCO 1001).

On 10 August 2004, at ca. 1800 h, we encountered an adult male *K. sonoriense* (114.5 mm MCL, 169 g) in a small pool (ca. 1 m^2 area, ca. 15 cm deep) with a dead Mockingbird (*Mimus polyglottos*). The intact, feathered head and wings of the bird were floating on the water surface. Below the water surface was the bird's skeleton, which had been picked nearly clean of soft tissue. The turtle had bird flesh on its face and foreclaws. After we identified the turtle, we photographed the bird and observed the turtle feeding on scraps of the bird that had settled to the bottom of the pool. We do not know how the bird died and are uncertain as to whether our observation involved predation or scavenging.

Mud turtles are common in shallow pools in our study area (Stone 2001. Southwest. Nat. 46:41–53). The obvious benefits of inhabiting these pools include hydration and opportunities to eat invertebrates, which are common in pools. Our observations, coupled with those of Ligon and Stone (*op. cit.*), suggest that pools might provide opportunities for mud turtles to eat relatively large vertebrates, and that vertebrates might be more important to the diet of *K. sonoriense* than previously thought.

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MACROCHELYS TEMMINCKII (Alligator Snapping Turtle). **AERIAL BASKING.** *Macrochelys temminckii* is generally believed to be largely aquatic, with only females leaving the water for the purpose of depositing eggs (Ernst et al. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, D.C., 578 pp.). We are aware of only two published records of aerial basking in *M. temminckii* (Ewert 1976. Herpetologica 32:150–156 and Shelby and Jensen 2002. Herpetol. Rev. 33:304); both involved juveniles and in the latter report basking was inferred but not actually witnessed.

On 5 May 2003 at ca. 1000 h in the Big Thicket National Preserve in eastern Texas, USA, a sub-adult *M. temminckii*, ca. 35–40 cm carapace length, was observed basking on a fallen tree above a creek. The turtle appeared to have been there for some time as its shell and the log were dry. At this point the creek was perhaps 8–10 m wide and 1.5–2 m deep with a moderately flowing current. The fallen tree trunk that the turtle was basking on was ca. 60 cm diameter with the uprooted end on the bank and the other end submerged in the creek. The tree trunk emerged from the water near the center of the creek at a 30–40° angle. To reach the basking spot, the turtle presumably climbed onto the submerged end of the tree and walked up the trunk 3–4 m to a spot 1 m above the surface of the water. It was positioned anterior end facing upward. We estimated air temperature at 24–29.5°C, with clear to partly cloudy skies. After watching the turtle for a period of 10–12 minutes, during which time it remained motionless, we approached for a closer view and an attempt to photograph the animal; at that point, the turtle dropped into the water, submerged, and disappeared from view.

A single *Graptemys* sp. was clearly observed basking on a nearby log simultaneously. Ewert (1976, *op. cit.*) also noted the proximity of "about seven" basking *Graptemys pseudogeographica sabinensis* and the similarity of chosen basking sites of the two species.

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PODOCNEMIS EXPANSA (Amazonian Giant River Turtle). **PREDATION**. Grillotalpid crickets have been reported as turtle egg predators, specifically on *Dermochelys coriacea* in Guyana (Maros et al. 2003. Mar. Ecol. Prog. Ser. 249:289–296; Schouten et al. 1997. Stud. Nat. Hist. Carib. Region 73:63–69), and *Podocnemis expansa* in Colombia (Valenzuela 2001. J. Herpetol. 35:368–378). These reports note mole crickets as turtle egg predators but not as predators of hatchling turtles. Here we report on mole cricket predation on hatchling *P. expansa* in Venezuela.

In late March 2003, during the nesting season of *P. expansa* on Playita Island, middle Orinoco River, between Apure and Bolívar states, Venezuela, we found turtle nests with several dead hatchlings, as well as live hatchlings with injures to the head, neck, forelimbs, and hindlimbs. These injures were caused by two-clawed mole crickets, *Scapteriscus* sp. We noticed that nest infestation by mole crickets occurred near the end of the dry season and beginning of the rainy season (between March and May). Additionally, we observed that each infested nest contained a single cricket, typically an adult or in the last instar.

Although many nests were infested, the predation rates on hatchlings turtles were probably not significant. Hatchling predation in the nest by *Scapteriscus* sp. might be incidental to egg predation, which would explain the broken and damaged eggs in the nests late in incubation. Egg predation on *P. expansa* by *Scapteriscus* sp. crickets is here inferred, based on the published evidence (Maros et al., *op. cit.*; Schouten et al., *op. cit.*; Valenzuela, *op. cit.*) while the hatchling turtle predation is based on direct observation.

This note adds to the knowledge of the predators of *P. expansa* hatchlings and eggs, which is essential information for refinement of the conservation program for this endangered species.

The crickets were deposited at Museo de Biología de la Universidad del Zulia (MBLUZ-I-1123).

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SIEBENROCKIELLA CRASSICOLLIS (Black Marsh Turtle). **FIRE SCARS**. Occurrence of fire scars on the shells of turtles is best described for the North American box turtle (*Terrapene carolina*) (Dodd et al. 1997. Herpetol. Nat. Hist. 5:66–72; Rose 1986. Southwest. Nat. 31:131–134; Smith 1958. Turtox News 36:234–237). Scars often result from the turtle being exposed to fire while partially buried in terrestrial habitats with the mid-dorsal and posterior areas of the carapace burned most frequently. *Siebenrockiella crassicollis* has been described as a bottom-walking aquatic turtle that inhabits deep ponds, marshes, sluggish streams, and swamps (Ernst and Barbour 1989. Turtles of the World. Smithsonian Inst. Press, Washington, D.C.; Iskandar 2000. Turtles and Crocodiles of Insular Southeast Asia and New Guinea. PALMedia Citra, Bandung, Indonesia; Liat and Das 1999. Turtles of Borneo and Peninsular Malaysia. Nat. Hist. Publ. [Borneo], Sabah, Malaysia). It is known to walk on land, presumably during movements between aquatic habitats (Liat and Das, *op. cit.*). We report here on observations of fire scars in a sample of *S. crassicollis* that suggests heretofore unrecognized terrestrial activity.

A large sample of *S. crassicollis* was among the 7500 turtles putatively from Malaysia that were confiscated by Hong Kong authorities on 11 December 2001. Approximately 3200 of the 16 species of turtles were shipped to the United States in January 2002 for processing and distribution to rescue centers, zoos, veterinarians, and university research programs (Hudson and Buhlmann 2002. Turtle and Tortoise Newslett. 6:11–14). A total of 1002 *S. crassicollis* was received in three shipments (Ades and Crow 2002. Turtle and Tortoise Newslett. 6:2–7). All had apparently been harvested aquatically, as some had fish hooks in their mouths or necks. During the triage, marking, and measuring process we discovered that several of these turtles were scarred on the carapace in various configurations with varying amounts of the keratin apparently removed by fire. A total of 45 *S. crassicollis* had such scars (4.49% of the total sample). Eighteen were males (129–202 mm carapace length) and 27 were females (137–199 mm CL); all were adults. In the data set available, two (both females) had scars on > 50% of the carapace, 13 (5 males, 8 females) had scars on 21–50% of the shell, and 19 (8 males, 11 females) had one or more smaller areas burned away. Fourteen turtles (6 males, 8 females) were burned on the dorsum of the carapace, 4 on the left side (2 each), 6 on the right side (3 each), and 14 on the rear of the carapace (5 males, 9 females). None of the fire scars was fresh and all were healed, indicating that each turtle survived its burns. Our interpretation of these scars as being derived from fire damage is consistent with those seen in other species such as *Terrapene carolina* (e.g., Dodd et al. 1997, *op. cit.*).

The existence of extensive fire scars on the carapaces of these bottom dwelling aquatic turtles (Ernst and Barbour, *op. cit.*) suggests that some individuals spent time buried terrestrially in habitats consisting of leaf litter or dead grass, possibly during times of the year when local residents set fires to grasslands and the grass understory in open forests; such fires are set annually (often in the spring) in parts of Asia to help generate fresh vegetative re-growth (KAB and JCM, pers. obs.). Our observations suggest that populations of *S. crassicollis* may inhabit seasonally-ponded wetlands with fluctuating hydrologies, but the reasons for a presumed terrestrial phase in the life history of *S. crassicollis* are not known. Investigation into this aspect of their behavior may reveal patterns of terrestrial habitat use heretofore unrecognized by chelonian biologists.

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LACERTILIA

ACANTHOCERCUS ATRICOLLIS (Blue-headed Tree Agama). **ENDOPARASITES.** *Acanthocercus atricollis* is known from central and western Kenya, the southern half of Uganda, northern Rwanda and parts of Tanzania (Spawls et al. 2002. A Field Guide to the Reptiles of East Africa. Academic Press, San Diego. 543 pp.). To our knowledge, the only nematode species previously found in *A. atricollis* is *Strongyluris ornata* (Harwood 1935. J. Tennessee Acad. Sci. 19:132–141). The purpose of this note is to report two additional nematode species from *A. atricollis.*

Ten *A. atricollis* (4 females, 6 males) (mean SVL = 103 mm ± 14 SD, range = 69–123 mm) collected at Ntandi, (01°15'S, 29°59'E;1872 m) Uganda in June–July 1967 and deposited in the herpetology collection of the Natural History Museum of Los Angeles County (LACM 38748–38754, 38756–38758) were examined for helminths. The esophagus, stomach, small intestine, and large intestine were opened and separately examined for helminths under a dissecting microscope. The body cavity was also searched. Nematodes were placed in a drop of concentrated glycerol and allowed to clear for 24 h. They were then placed on a glass slide, cover-slipped and examined under a compound microscope. Found in the stomach were 42 *Abbreviata benoiti* (prevalence, infected lizards/lizards examined x 100 = 80%; mean intensity, mean number nematode per infected lizard = 5.3 ± 8.6 SD; range: 1–16). Found in the coelom were 7 *Saurositus agamae* (prevalence, 40%, mean intensity, 1.8 ± 1.0 SD; range: 1–3). The nematodes were deposited in the United States National Parasite Collection: *Abbreviata benoiti* (USNPC 94765) and *Saurositus agamae* (USNPC 94766).

Horchner and Weissenberg (1965. Zeit. Parasit. 25:491–500) described *Abbreviata benoiti* from *Acanthocercus cyanogaster* from the Congo. *Acanthocercus atricollis* is the second host reported to contain this nematode. *Saurositus agamae* has previously been reported from the agamids *Laudakia caucasica* (Sharpilo 1976. Izdat. "Naukova Dumka." Kiev, Russia. 287 pp.), *Agama agama* (Macfie 1924. Ann. Trop. Med. Parasit. 18:409–412), and *Agama mossambica* (Bain 1969. Ann. Parasit. Hum. Comp. 44:581–594). *Acanthocercus atricollis* represents a new host record for *Abbreviata benoiti* and *Saurositus agamae*; Uganda is a new locality record.

We thank Aaron Bauer (Villanova University) for confirming the identity of *Acanthocercus atricollis*.

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AMPHISBAENA IBIJARA (NCN). **PREDATION**. Snakes, especially elapids, are important predators of amphisbaenians (Marques and Sazima 2004. *In* Marques and Duleba [eds.], Estação Ecológica Juréia-Itatins Ambiente Físico, Flora e Fauna, pp. 257–277, Ribeirão Preto, Holos Editora; Cunha and Nascimento 1993. Bol. Mus. Para. Emílio Goeldi, Sér. Zool., Belém, [9]:1–191). Here, we augment documentation of elapid predation on amphisbaenians with an observation of predation on the recently described *Amphisbaena ibijara* (Rodrigues et al. 2003. Phyllomedusa 2:22–26) by the fossorial *Micrurus ibiboboca* in NE Brazil.

At 2324 h on 9 March 2004, we collected an adult female *M. ibiboboca* (628 mm SVL) as it was resting on litter in an eucalyptus plantation near the municipality of Urbano Santos (3°12'28"S, 43°24'12"W; elev. 41 m), State of Maranhão, and placed it in a plastic bottle. The next morning, the snake regurgitated an adult male *A. ibijara* (198 mm SVL) with its anterior end partially digested and therefore was presumably ingested head first (Fig. 1).

Micrurus ibiboboca exhibits both diurnal and nocturnal activity, and is regionally common (Lima 2003. Composição e diversidade de serpentes em um mosaico de habitats no município de Urbano Santos, Maranhão. Dissertação de mestrado, Mus. Para. Emílio Goeldi, Belém-PA. 61 pp.). The frequency of *M. ibiboboca* predation on *A. ibijara* is not known, but might be common because both species appear to be common and use the same microhabitat. This represents the first record of an *A. ibijara* predator.

FIG. 1. *Amphisbaena ibijara* with the front end of body partially digested.

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ANOLIS CAROLINENSIS (Green Anole). **BEHAVIOR.** Native to the southeastern United States (Smith 1946. Handbook of Lizards of the United States and Canada. Cornell Univ. Press. Ithaca, New York, 557 pp.), *A. carolinensis* was first reported in the wild in the Hawaiian archipelago on Oahu in 1950 (McKeown 1996. A Field Guide to Reptiles and Amphibians in the Hawaiian Islands. Diamond Head Publishing, Inc, Los Osos, California. 172 pp.). It has since spread to adjacent islands and was first documented from Kauai in 1987 (Mayer and Lazell 1992. Bull. Ecol. Soc. America 73:265). Based on observations in 1991 and 1994, Michael (1996. Elepaio 56:1–4) described a population of *A. carolinensis* and its persistence following a major hurricane. However, these visits provided only limited opportunity to draw parallels in behavior between this introduced population and populations of *A. carolinensis* in their native range. Moreover, data on introduced *A. carolinensis* populations are sparse. Hence, this report, which describes a follow-up visit made to the same site in 1998 earlier in the season than previous visits, afforded the opportunity to better describe similarities in *A. carolinensis* behavior to populations in its native range.

Between 26 June and 6 July 1998, I made observations of *A. carolinesis* living in landscape vegetation on the landward side of the Kuhio Shores condominium complex, located 3 km S of Koloa Town on the southern shore of Kauai. This is the same location studied in July–August 1991 and 1994; Michael (*op. cit.*) describes general aspects of this site. In 1992, Hurricane Iniki made landfall on southern Kauai and inflicted substantial damage to the condominium structure as well as the landscaping in which the *A. carolinesis* lived. Structural and landscape repairs were near completion during the 1994 visit. Landscape maintenance was less intensive in 1994 as compared to 1991 or 1998; watering was done every few days and little or no systematic raking or debris removal was apparent. Intensive landscape maintenance was not begun until reconstruction was completed so as not to interfere with repairs. By 1998, daily landscape maintenance such as watering, raking of debris, and pruning resumed to pre-Iniki levels.

In 1998, landscape plants consisted of a similar mixture of species of ornamental groundcover, shrubs, palms, and other trees as described in Michael (*op. cit.*). Multiple vegetation layers and an interconnected overstory of trees were the result of increased care (water, pruning, fertilizing). Groundcover plants were the same species but increased watering roughly doubled the height (to ca. 20 cm) of the stem-leaf matrix over that in 1994. The landscaped area was a roughly L-shaped unit ca. 3 m wide between the parking lot and condominium walkways; the short leg of this L was ca. 20 m and the long leg was ca. 50 m. In 1998, except for concrete walkways, groundcover occupied the entire landscaped area in a continuous bed, whereas in 1994, bare dry soil separated only a few isolated clumps of plants (ca. 3 x 3 m). In 1998, as in 1991, daily watering occurred. In 1998, three smaller palms replaced the single large palm tree near to which all *A. carolinesis* were observed in 1991 and 1994; each of the three palms was ca. 10 cm in diameter and 5–8 m tall.

Similar to previous years, I visual-encounter surveyed for *A. carolinesis* daily during daylight hours, usually mid-morning and mid-afternoon. Each lizard was classified as to gender (male, female, or unknown) and age group (adult, juvenile, or hatchling; *fide* Michael, *op. cit.*). Most animals were sexed using behavior and appearance, but not marked. Males were larger and had larger heads than females, displayed dewlaps and sagittal crests (no significant dewlap or sagittal crest in females) and engaged in fights with other *A. carolinesis* (rare in females). I also made random observations of *A. carolinesis* at four additional localities (Koloa Town, Lihue, Kapaa, and Kilauea) around Kauai. While less systematic than observations made at Kuhio Shores, they offered a point of reference for study of the Kuhio Shores population.

I recorded an average of 2.6 *A. carolinesis*/day (s = 1.7, range: 1–6, N = 8 days) in 1998, a mean of 2.7 *A. carolinesis*/day (s = 1.6, range: 1–6, N = 11 days) in 1991, and a mean of 2.3 *A. carolinesis*/day (s = 2.3, range: 1–4, N = 11 days) in 1994. No significant differences were found in the numbers of *A. carolinesis* encountered among years (Kruskal-Wallis test: df = 2, $P = 0.8928$). However, I observed only adult green *A. carolinesis* at Kuhio Shores in 1998, whereas in 1991 and 1994, 87% (N = 26) and 84% (N = 21) of the *A. carolinesis* I found were non-adults. Numbers of adults and non-adults in 1991 were not significantly different from adult and non-adult numbers in 1994 (Fisher's Exact Test: $P > 0.9999$), but adult and non-adult numbers in 1998 were significantly different from those in each of 1991 and 1994 (Fisher's Exact Test: $P < 0.0001$; adjusted a for three tests was 0.17). Observations of *A. carolinensis* made around the island during each year visit paralleled those made at Kuhio Shores, i.e., most *A. carolinesis* seen during the 1991 and 1994 visits were non-adults, whereas only adults were seen in 1998. In 1998, it also appeared that adults responded to the observer by displaying, and thus, drew attention to themselves. In 1991 and 1994, the few adults observed did not initially respond to the observer; they remained still or fled but did not bob or display dewlaps or sagittal crests.

Anolis carolinensis numbers were similar among years, but the salient aspect of observations was finding exclusively adults, especially behaviorally prominent males, in 1998. As similar observations were made throughout Kauai in 1998, the age group pattern of observations was not localized. This difference might reflect typical behavior for these age groups through a seasonal breeding cycle. In its native range, *A. carolinesis* breed from early May to late July (Jenssen and Nunez 1998. Behaviour 135:981–1003). The 1991 and 1994 visits were in late July–early August, whereas the 1998 visit occurred in late June–early July. Greater visibility, particularly of males in 1998, differed from the two previous visits. This pattern would fit observations of free-ranging *A. carolinesis* in their native range, where males spent most of their time near the ground and displayed more than 15 times as often during May–July versus August–September (Jenssen et al. 1995. Herpetol. Monogr. 9:41–62). This behavior changed significantly at the July/August boundary, when males switched from being socially oriented to being largely solitary animals (Jenssen et al., *op. cit.*).

Lack of juveniles during the 1998 observations has at least two likely explanations. The first is that eggs had not yet hatched. In Florida, egg-laying occurs during May–July with hatching occurring as early as mid-June (Smith 1946, *op. cit.*). The 1998 visit might have occurred just before hatching. The second possibility is that hatchlings were less detectable in the lusher vegetation present in 1998. In 1991 and 1994, the hatchlings were observed on the surface of groundcover; juvenile behavior would also had to have changed in 1998 for them to remain undetected. Focused observations over at least the June–August interval would be necessary to clarify the basis of this pattern.

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CHAMAELEO MONTIUM (Mountain Chameleon). **REPRODUCTION.** *Chamaeleo montium* inhabits submontane to montane forests, secondary forests, and farm bush at 550–1200 m elevation in SW Cameroon (Hofer et al. 2003. J. Herpetol. 37:203–207). The species has a light green ground color in both resting or unexcited states (Neças 1995. Chamäleons. Bunte Juwelen der Natur. Edition Chimaira, Frankfurt. 249 pp.). Maturity occurs in the first year, gestation in two months (Neças, *op. cit.*) and reproduction appears to be aseasonal (pers. obs). Detailed field studies of this species are lacking. Hence, we describe aspects of *C. montium* reproductive behavior, including mate attendance, copulation, rejection, and coloration in SW Cameroon.

The study site, a cultivated garden adjacent to secondary forest and farmbush, was in the village of Nyasoso (4°49'289"N, 9°40'826"E; elev. 850 m) at Mt. Kupe, South West Province. The study period, 10 November 2002 to 29 March 2003, encompassed all of the dry season and the beginning of the rainy season. We observed an adult female (75 mm SVL) with missing tail tip which facilitated identification. We conducted observations on this female opportunistically, with multiple observations occurring on several days, especially when a male was nearby. We viewed chameleons from a 2-m distance, which did not appear to disturb their behavior. On 10 November, we observed a male (No. 1) with the female. Both chameleons were found at a height of ca 1.8 m in a *Penianthus* (shrub)/guava tree (*Psidium*) growth. The male was following the female, which walked very slowly away. When walking ceased, the female continued movement with a slow rocking motion; the female was dark brown to black in color with yellow spots on the head. The male was light green with bright yellow lateral stripes, head crowned with turquoise; small white spots were sprinkled throughout the head and body, and his throat was inflated.

The male mounted the female for copulation, pressing his chin flat against the female's body, head coloration remaining brilliant while the stripes and spots faded. The female remained dark, pressed her body flat against the branch and lifted the base of her tail slightly. The male's tail moved under the female's as he attempted to press his cloaca against hers. Duration of this courtship and copulation sequence was ca. 20 min. This male exhibited postcopulatory mate guarding, that is, he remained next to but not in contact with the female, throughout this and the following day. The female's color returned to green the following day. We marked the male with a small dot of brown paint on the flank before his departure; this mark did not appear to affect any behaviors involving himself and other chameleons.

On 2 December, we again observed this female exhibiting a dark brown color and found a second male chameleon (No. 2) ca. 20 cm away. On 3 and 4 December, the color of the female had returned to green with bright yellow spots over the rump; Neças (*op. cit.*) indicates that this color pattern represents a rejection coloration for this species. Number 2 was resting ca. 10 cm away and was dark with turquoise spots around the crown of its head. Positioning of the two chameleons varied from head to tail—male posteriorly—or tail to tail. We similarly gave this male a unique paint mark. On 5 December, the female exhibited black coloration and aggressively chased male No. 2 away. Her dark coloration remained throughout the following day. This sequence characterizes a mating rejection (Cuadrado 2000. Ethology 106:79–91).

The female was found to be gravid (verified by abdominal palpation) on 5 January. This female was observed 74 times in the 56-day period, and no other males were seen in the vicinity of the female, so the eggs might be the result of the previously described presumably successful mating observed with male No. 1. On 17 January, the female was observed perched close to the ground; she was palpated, but lacked calcified eggs; egg deposition is thought to have occurred on that date (68 days post- mating).

On 23 January, male No. 1 was again found tending this female. Mating was observed at 1600 h on the following day, with a similar pattern and duration as previously described. This male was again with the female for two days, departing on 26 January. Abdominal palpation revealed the presence of eggs on 5 March. Based on behavior and abdominal palpation, the female is thought to have laid eggs on 25 March, 61 days post mating.

Notably, male No. 1 appeared twice precisely when the female was receptive and was not detected nearby when she was not. This same male was observed interacting with an unknown female at a second location mid-January, so might have been engaged in reproductive pursuits throughout our study period. Whether male *C. montium* are attuned to the temporal patterns of females which exhibit repeated reproduction is unknown.

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CNEMIDOPHORUS COSTATUS BARRANCARUM (Barranca Whiptail Lizard) **REPRODUCTION**. We augment preliminary findings on reproduction for *Cnemidophorus costatus barrancarum* (= *Aspidoscelis costata barrancarum*; Reeder et al. 2002. Amer. Mus. Novitat. 3365:1–61) presented in Walker et al. (2003. Herpetol. Rev. 34:365). We dissected 60 specimens in the Herpetological Collection of Unidad de Biología, Tecnología y Prototipos (UBIPRO) collected by JLE at the periphery of the range of the subspecies in southwestern Chihuahua, México, in 2002 (9015–9018, 9053, 9071–9073, 9240–9243, 9280, 9287, 9331, 9347, 9354, 9355, 9365, 9374, 9420, 9471, 10599, 10600, 10625, 10626. 10633, 10651, 10652) and 2003 (11334–11336, 11365, 11366, 11392–11396, 11475–11482, 11503–11506, 11508–11510, 11528–11533) in addition to the 14 collected by him in 2000 (5908–5910, 55918, 5940) and 2001 (7316–7319, 7328–7330, 7369, 7373) and previously discussed by Walker et al. (2003, *op cit.*). Data are presented by sex as ratios, ranges of variation, and/or means (to one digit after the decimal) ± 1 SE. Numbers of males and females of *C. c. barrancarum*, respectively (in parens), by year were: 2000 (1:4); 2001 (2:7); 2002 (16:13); 2003 (22:9). Numbers of males and females, respectively (in parens), by size (as 10 mm SVL increments) in the UBIPRO sample were: 40–49 mm (0:2); 50–59 (4:1); 60–69 (2:6); 70–79 (7:10); 80–89 (10:10); 90–99 (9:4); and 100–112 (9:0). Data for the 2002 and 2003 samples, added to information in Zweifel (1959. Bull. Amer. Mus. Nat. Hist. 112:57–116) and Walker et al. (2003, *op. cit.*), update knowledge of reproductive characteristics for *C. c. barrancarum* as follows: clutch size, 4.3 ± 0.33 (range 2–8, N = 24) eggs; mean size of adult females, 81.3 ± 1.65 (range 67–97, N = 27) mm SVL; mean size of adult males, 88.9 ± 1.96 (range 69–112, N = 36) mm SVL. One female (UBIPRO 11478 of 97 mm SVL) contained only two left and no right yolked ovarian follicles; implying reproductive senescense if large size reflects old age. Another female (UBIPRO 11532 of 88 mm SVL) had a clutch arrangement not seen among hundreds of *Cnemidophorus* lizards JMW has previously dissected. Besides the presence of 4 left and 3 right yolked ovarian follicles of 8.0–9.5 mm in diameter, the left oviduct of this individual contained an unusually large egg of 8.0 x 19.0 mm. Females of *Cnemidophorus* with oviductal eggs typically have either no yolked ovarian follicles (usual case) or very small ones of 3–4 mm in diameter. Clutch size was positively correlated with SVL (adjusted $r^2 = 0.47$, N = 24) and removal of the outlier UBIPRO 11478 markedly strengthened the relationship (adjusted $r^2 = 0.70$).

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CNEMIDOPHORUS NEOMEXICANUS (New Mexico Whiptail Lizard). **REPRODUCTION**. Studies of reproductive characteristics in parthenogenetic *Cnemidophorus neomexicanus* (= *Aspidoscelis neomexicana*; Reeder et al. 2002. Amer. Mus. Novitat. 3365:1–61) in New Mexico (Medica 1967. Bull. South. California Acad. Sci. 66:251–276; Christiansen 1971. Amer. Mus. Novitat. 2442:1–48) have revealed few reproductively active females in July and none in August samples. In the most detailed study (Christiansen 1971, *op. cit.*), gravid females were collected as early as 27 April and as late as 19 July; however, only 12/75 (16%) females in July samples were gravid.

We used University of Arkansas Department of Zoology (UADZ) specimens collected by JEC in southwestern New Mexico to add significant details to knowledge of reproduction in *C. neomexicanus*. Eight adults of this species collected on 6 (UADZ 6180–6183, 6195, 6196 from 21.3 km NW of jct New Mexico Hwy 90 and US Hwy 70 on 70 W) and 7 (UADZ 6188, 6189 from 12.2 km NW of jct New Mexico Hwy 90 and US Hwy 70 on 70

W) August 1998 in Hidalgo County included two gravid females: UADZ 6188 (69 mm SVL, 10.2 g) and UADZ 6189 (70 mm SVL, 10.0 g). Each had two eggs of ca. 9 x 15 mm, one in each oviduct. Nine adults collected on 10 (UADZ 7070–7074) and 12 (UADZ 7093–7096) August 2002 2.9 km N of the Grant County boundary on New Mexico Hwy. 464, included a gravid female UADZ 7074 (68 mm SVL, 10.2 g) with one egg in each oviduct of ca. 9 x 15 mm. These observations based on August collections extended the known reproductive cycle of *C. neomexicanus* by almost a month by a similar percentage of reproductive females (3/17, 17.6%) as was reported among July females from Bernalillo County by Christiansen et al. 1971 (*op. cit.*). Moreover, based on reports of incubation periods of 46 (Christiansen 1971, *op. cit.*) to 54 (Medica 1967, *op. cit.*) days in *C. neomexicanus*, the gravid individuals identified in this note extend potential egg hatching dates in this species from between 19 July and 16 August (Christiansen 1971, *op. cit.*) to as late as October. Such late-season neonates would have a feeding and growth period of about a month before the onset of suboptimal fall temperatures in Hidalgo and Grant Counties, New Mexico. Variable hatching dates over more than two months might account for the wide range of SVLs observed among second-year individuals of *C. neomexicanus* in some April–June collections from southwestern New Mexico. Yearly temperature conditions and amount and timing of rainfall likely strongly influence the reproductive cycle in this species.

Specimens of whiptail lizards were collected in New Mexico under authority of permits granted to the authors by the New Mexico Department of Game and Fish.

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CNEMIDOPHORUS SEXLINEATUS (Six-Lined Racerunner). **BEHAVIOR**. Among diverse thermoregulatory behaviors that vertebrates perform, alternate foot-lifting behavior has been documented in the South African Namib Desert lacertid, *Aporosaura anchietae* (Louw and Holm 1972. Madoqua 1:67–85). Characterized by brief synchronous lifting of trans-leg pairs, this behavior is performed to avoid prolonged contact with hot substrates. Here, we report similar behavior in the Six-Lined Racerunner, *Cnemidophorus sexlineatus,* from central Florida.

We made these observations while conducting research on the Florida Sand Skink (*Neoseps reynoldsi*) in July 1994 on a rosemary scrub habitat in Orange County near Orlando (24°21'31"N, 81°35'28"W; elev. 30 m). Scrub habitat is characterized by low stature oak canopies, with a midstory of palmetto and other woody plants, and herbaceous and lichen ground cover. During the summer, sand surface temperatures can reach 44.4°C (Collazos 1998. Microhabitat Selection in *Neoseps reynoldsi*, the Florida Sand-swimming Skink. MSc Thesis, University of South Florida. 81 pp.). We cornered an adult (ca. 100 mm SVL) *C. sexlineatus* at the base of a thick-trunked (ca. 14 cm diam) Myrtle Oak (*Quercus myrtifolia*). During a 15-sec observation period, this individual performed at least four bouts of alternate foot-lifting behavior before it disappeared into a nearby Saw Palmetto (*Serenoa repens*) thicket.

We are unaware of any reference to alternate foot-lifting behavior in association with agonistic interactions in any animal taxa. Given the high surface temperatures (air temperature ranged from 33.3 to 37.2°C based on local weather data), we believe that this behavior was a thermoregulatory response rather than anti-predator behavior directed at us as observers. The context of further observations will be needed to verify our interpretation of this behavior. Alternate foot-lifting behavior has been anecdotally observed in few lizards other than *A. anchietae* (i.e., *Cnemidophorus lemniscatus*, Laurie Vitt, pers. comm.), but has seldom if ever been published. If our interpretation is correct, this would represent the first time that alternate foot-lifting behavior, putatively thermoregulatory, has been reported in *C. sexlineatus*.

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CNEMIDOPHORUS SEXLINEATUS VIRIDIS (Prairie Racerunner). **MAXIMUM BODY SIZE**. Recently, the maximum total length of *Cnemidophorus sexlineatus viridis* (= *Aspidoscelis sexlineata viridis*) was reported as 267 mm (84 mm SVL; Toal and Collins 2003. Herpetol. Rev. 34:59) as determined from an adult female from the southern Ozarks of Missouri (Barry County). Herein, I report on a new maximum body size for this species from Arkansas.

On 28 December 1974, I unearthed an adult female *C. sexlineatus viridis* from a hibernation burrow on a roadside embankment, 5.1 km N Dover off State Hwy 7 (Pope County; 35°27.98'N, 93°8.25'W; elev. 218 m). This female was 90 mm SVL at the time of collection and had a 115 mm partly regenerated tail (regenerated portion = 77 mm). Re-measurement of the female on 28 February 2004 yielded the original SVL, which exceeds the previously reported maximum by 6 mm.

The specimen was deposited in the Arkansas State University Museum of Zoology herpetological collection (ASUMZ 28204) and collected under the authority of an Arkansas Game & Fish Commission scientific collection permit.

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COLEODACTYLUS MERIDIONALIS (NCN). **PREDATION**. *Coleodactylus meridionalis* is a poorly known litter-dwelling gekkonid lizard distributed in the Caatinga and Atlantic Rainforest of northeastern Brazil (Vanzolini et al. 1980. Répteis das Caatingas, Academia Bras. Ciências, São Paulo. 161 pp.). Recently, Dias et al. (2003. Herpetol. Rev. 34:142–143) provided data on diet and feeding habits for *C. meridionalis* from "restinga" (an herb and shrub association on sand dunes along the Brazilian coastline), a habitat within the Brazilian Atlantic rainforest biome. Here, we report a predation event on an individual of *C. meridionalis* by a sympatric tropidurid lizard, *Tropidurus hygomi*, from a restinga site in northeastern Brazil.

During analysis of the stomach contents of 24 *T. hygomi* from Dunas do Abaeté (12°57'03"S, 38°22'30"W; elev. 15 m), municipality of Salvador (Bahia State), one of us (MMFV) found remnants of a *C. meridionalis* in the stomach of an adult female *T. hygomi* (46.2 mm SVL). Comparison with vouchers of *C. meridionalis* from the Museu de Zoologia da Universidade Federal da Bahia (MZ-UFBA) confirmed the identity of the prey. The female *T. hygomi* was deposited at the MZ-UFBA (UFBA-LAG 639).

Tropidurus hygomi is a diurnal, heliothermic, terrestrial tropidurid endemic to "restinga" habitats of northeastern Brazil (Vanzolini and Gomes 1979. Papéis Avulso de Zoologia [São Paulo] 21:243–259). This species, typically a sit-and-wait predator, displays opportunistic feeding behavior on invertebrates and small vertebrates, including other lizards (Vargens 2003. Ecologia de *Tropidurus hygomi* [Sauria: Tropiduridae] na restinga do Abaeté – Salvador –Bahia. Bachelor's Thesis, Departamento de Zoologia, Univ. Fed. da Bahia, 45 pp.). At Dunas do Abaeté, *T. hygomi* uses mostly habitats covered with leaf litter, the microhabitat where *C. meridionalis* is typically found, thereby facilitating encounters. Small litter-dwelling lizards like *C. meridionalis* are rarely surface visible, so opportunistic foraging might best explain their predation by sympatric tropidurids, including *T. torquatus* (Araújo 1991. Rev. Brasil. Biol. 51:857–867; Teixeira and Giovanelli 1999. Rev. Brasil. Biol. 59:11–18), *T. hispidus* (Vitt and Carvalho 1995. Copeia 1995:305–329; Vitt 1995. Occ. Pap. Oklahoma Mus. Nat. Hist. 1:1–29), and *T. semitaeniatus* (Vitt, *op.cit.*).

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COPHOSAURUS TEXANUS (Greater Earless Lizard). **SAUROPHAGY.** *Cophosaurus texanus*, a generalist invertebrate consumer, is known to prey on members of at least 12 different arthropod orders (Maury 1995. J. Herpetol. 29:266–272). Its diet is well known, but neither saurophagy nor cannibalism has been reported. Here, we provide observations of cannibalism and saurophagy for *C. texanus* from Nuevo Leon, México.

At 1246 h on 28 September 2002 in Casa Blanca Canyon near the municipality of Santa Catarina (25°38'13.7"N, 100°42'39.1"W; elev. 1360 m), we observed a female *C. texanus* (48 mm SVL, 59 mm tail) capture and eat a small conspecific male (25 mm SVL). Local habitat is desert scrub and chaparral on a calcareous geology. The female *C. texanus*, which was perched on a rock of ca. 30 cm high, ran a 0.5 m distance to capture the young male that was perched on a smaller rock. The male, captured by one side of the head (after dissection, a semi-circular depression was observed in the parietal region), was swallowed with slow undulatory movements; ingestion took about 3 min. The ingested lizard's tail was in three parts (total length ca. 25 mm). The female (UANL 6341) was collected, dissected, and deposited in the herpetological collection of the Universidad Autónoma de Nuevo León. Dissection of the stomach also revealed the forelimb and the hindlimb of a *Sceloporus couchii,* presumably from the same individual. Based on comparison of the limb fragments with preserved specimens, the ingested *S. couchii* was ca. 26 mm SVL.

Our observations show that *C. texanus* can prey on small lizards, including conspecifics. We thank Marc P. Hayes and Glafiro Alaniz F. for their help with this note.

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CROCODILURUS AMAZONICUS (Jacarerana). **DIET.** *Crocodilurus amazonicus* is a semi-aquatic macroteiid (males 80–248 mm SVL; females 83–320 mm SVL) widely distributed in the Amazon Basin (Ávila-Pires 1995. Zool. Verh. Leiden 299:1–706). Little is known of its ecology; beyond general information on its semi-aquatic habit, one report on its diet exists (Márcio Martins in Avila-Pires, *op. cit.*) noting that 10 young *Bufo marinus*, a large odonate, and one hemipteran were found in the stomach of an adult. Here, we add to the sparse dietary data with the first record of a reptile in *C. amazonicus* diet.

During a field survey for the project "Herpetofauna das savanas amazônicas: subsídios para sua preservação" in August 2003 in the city of Humaitá, State of Amazonas, Brazil (7°30'22"S, 63°01'15"W; elev. 60 m), we collected a series of 30 *C. amazonicus* on the margin of the Puruzinho River. In examination of the stomach contents of an adult (200 mm SVL) female, we found an intact young male *Helicops polylepis* (Colubridae: Xenodontinae) with a total length of 310 mm.

Helicops polylepis is a semi-aquatic, nocturnal snake that is also widely distributed in Amazonia (Cunha and Nascimento 1978. Publ. Avul. Mus. Par. Emílio Goeldi 31:1–218; da Silva and Sites 1995. Conserv. Biol. 9:873–901). As *Crocodilurus* spends most of the time in water or near water, frequent opportunity to encounter *H. polylepis* might exist.

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CTENOPHORUS FIONNI (Peninsula Dragon Lizard). **CANNIBALISM.** Cannibalism has been reported in many reptiles (Mitchell 1986. Cannibalism in Reptiles: A Worldwide Review. SSAR, Oxford, Ohio. 37 pp.), but has rarely been recorded among Australian agamids. One such agamid, *Ctenophorus fionni*, is restricted to rocky habitats on the Eyre Peninsula in South Australia. Little is known of this medium-sized lizard (96 mm max. SVL), which seems to be largely insectivorous (Johnston 1997. Behavioural Ecology of the Peninsula Dragon lizard *Ctenophorus fionni*. Ph.D. dissertation. Flinders University, Adelaide, 307 pp.). Here, I report the first record of cannibalism for this species.

During a mark-recapture study of *C. fionni* on 2 February 1992, I caught an adult male (71.5 mm SVL, 14.0 g) at Secret Rocks (33°12'S, 135°51'E; elev. 279 m), South Australia. While processing this lizard, I found a second, recently killed individual of the same species in his gullet. The dead lizard was subsequently regurgitated (Fig. 1). The size of the regurgitated lizard (32 mm SVL) and the timing of the observation indicate that it was a hatchling (Johnston 1999 J. Herpetol. 33:694–698). After being photographed, the adult male was released and the dead juvenile was discarded.

The South Australian National Parks & Wildlife Service, and the Flinders University Animal Ethics Committee granted permits for this work.

FIG. 1. Male *Ctenophorus fionni* regurgitating a conspecific juvenile, Secret Rocks, South Australia, 2 February 1992.

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CYCLURA CYCHLURA INORNATA (Allen Cays Iguana). **MORTALITY**. Mortality in adult *Cyclura cychlura* is rarely reported. Apart from recent records of predation on *Cyclura c. cychlura* on Andros Island in the Bahamas (Knapp 2004. Caribbean J. Sci. 40:265–269), no observations of natural mortality are recorded for this species (e.g., see Coenen 1995. Bahamas J. Sci. 2:8–14). Hence, we report a distinctive instance of mortality from the Allen Cays, northern Exuma Islands, Bahamas.

During mid-afternoon 12 May 2004, we discovered a female Allen Cay Iguana (27.0 cm SVL, 35.5 cm tail, 530 g) trapped between the multiple trunks of a tree (cf. *Drypetes diversifolia* fide Sandra Buckner) on Leaf Cay, an island in the Allen Cays (Fig. 1; see Iverson et al. 2004. Herpetol. Monogr. 18:1–36 for map and aerial photograph). This female was originally toe-clipped and PIT-tagged on 11 March 1998 at a SVL of 26.2 cm and an estimated age of 12.5 years; she had been recaptured during field work in 2001, 2002, and 2003 (weighing 705 g at the last capture). She was lethargic and somewhat emaciated when removed from between the branches, weighing 148 g less than estimated based on a regression equation relating SVL to mass for 168 other females captured on Leaf Cay during the same trip. She was still very sluggish when released 48 h later, following attempts to rehydrate her and nourish her with force-fed bananas. Although this iguana was still alive when discovered, we had previously found three mummified carcasses or nearly intact skeletons of subadult or small adult Allen Cay iguanas wedged between tree trunks on Leaf Cay in June 2001, and one on nearby U Cay (= Southwest Allen Cay) in May 2002. We also observed a mummified carcass of an adult *Cyclura rileyi* on Bush Hill Cay in the Exuma Land and Sea Park, central Bahamas on 21 May 2003 that had been similarly trapped in the crotch of a tree.

No predators capable of wedging an iguana between tree trunks occur on these islands. However, arboreality is common in the genus *Cyclura* (Iverson 1979. Bull. Florida St. Mus. Biol. Sci. 24:175–358), and the observed mortality likely occurred as individuals descended from trees where they had been feeding and/or thermoregulating. Many West Indian trees have multiple trunks and smooth bark; we suspect that the often poorly controlled descent (i.e., sliding) of these iguanas down tree trunks creates enough momentum to sometimes pin them between tree trunks such that they are unable to extricate themselves. This would explain why we have never observed the phenomenon in young iguanas or smaller cohabiting lizard species despite over 18,000 person-hours of field work over 25 years. The lack of similar observations for large adult *C. cychlura* may be a function of their reduced arboreality. This form of accidental death might occur with some frequency among subadult or small adult West Indian rock iguanas. We are unaware of similar records of mortality for any other lizard.

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CYCLURA LEWISI (Grand Cayman Blue Iguana). **HATCHLINGS.** Little is known of the behavior and ecology of hatchling *Cyclura* (Sauria: Iguanidae) and nothing is known about this age group in endangered *Cyclura lewisi*. Hence, we provide preliminary data on *C. lewisi* hatchling behavior and sizes.

On 26 August 2001, we measured and observed wild *C. lewisi* hatchlings from two nests that had been enclosed prior to emergence at the Queen Elizabeth II Botanic Park, Grand Cayman (19°19'N, 81°10'W; elev. 2 m). Hatchlings were measured after emergence, then allowed to recover for 5–10 min. Subsequently, one wall of the enclosure was removed, and hatchlings were allowed to exit at their own pace to minimize altering their behavior. We then followed five of them for focal animal observations, but lost sight of all of them in < 1 h.

All iguanas tongue-touched the ground as they moved away from the nest site. One hatchling headbobbed several times (2–4 bobs per episode) as it moved away, but we did not see the other iguanas display in this way. Three of five hatchlings climbed into trees within 20 min of leaving the nest enclosure, suggesting that hatchling *C. lewisi* might be more arboreal than adult conspecifics. Within 10 min of release, we witnessed an attempted predation on one hatchling by a snake, the Grand Cayman Racer (*Alsophis cantherigerus caymanus*). The iguana, apparently reacting instinctively to the snake's strike movement, escaped by jumping away and running ca. 3 m while the snake retreated back into a low wall, probably disturbed by the observer's presence. We had previously witnessed snakes trying to gain access to hatchling *C. lewisi* in enclosures, but this was the first direct observation of attempted snake predation on *C. lewisi* hatchlings in the wild.

One hatchling returned to the nest chamber on the same day after leaving the nest site and enclosure. The iguana might have been going to use the nest as a nocturnal retreat, but we accidentally disturbed it during nest excavation that evening.

Two of five hatchlings tested a potential food item within 10 min of leaving the nest enclosure, but each rejected the item (a dried piece of grass and a logwood leaf, *Haematoxylum campechianum*). Less than 15 min after leaving the enclosure, one hatchling spent 35 sec drinking rainwater from the edge of a pond. Another hatchling purposefully ate soil, a behavior we have also seen in adults.

Wild hatchlings had absorbed most of their yolk sac by the time they emerged, had closed umbilicae, were dry, and seemed markedly thinner than conspecifics immediately after the latter hatched from eggs incubated under controlled conditions. Captive hatchlings were wet at hatching, had abdomens swollen with yolk and visibly unsealed umbilicae, and showed no interest in food or water until 2–3 weeks after hatching. The difference in yolk supply between captive-hatched and wild-emerged iguanas, coupled with the immediate drinking and foraging behavior displayed by the latter, implies a post-hatching underground residence time in the wild. Hatchlings of other species of iguanas (subfamily Iguaninae) have been suggested to remain in the nest chamber for several days to two weeks before emergence (Wiewandt 1977. Ph.D. dissertation. Cornell University, Ithaca, New York; Christian and Tracy 1982. *In* Burghardt and Rand [eds.], Iguanas of the World: Behavior, Ecology, and Conservation, pp. 366–379. Noyes, Park Ridge, New Jersey).

Wild hatchlings averaged 94.3 mm SVL (s = 7.4 mm, N = 6), and were significantly smaller than captive-bred hatchlings (mean SVL = 100.8 mm, s = 3.6 mm, N = 17; Student's t test, t = 2.865, $P = 0.009$). The difference in size between wild and captive hatchlings might reflect differences in moisture levels or temperatures during incubation or differences in egg size relating to the age or nutritional state of the mothers (Packard and Packard 1988. *In* C. Gans and R. B. Huey [eds.], Biology of the Reptilia, vol.16, pp. 523–605. Alan R. Liss, New York).

Our observations were collected during research approved by the National Trust for the Cayman Islands and the Queen Elizabeth II Botanic Park.

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ENYALIOIDES COFANORUM (Cofan Wood Lizard). **REPRODUCTION**. *Enyalioides cofanorum* is a terrestrial hoplocercid known from the Amazonian lowlands of Ecuador and Peru. A female collected from Santa Cecilia, Ecuador in March 1972 had two ovarian eggs (ca. 26 mm long) and another collected in July contained two oviductal eggs (ca. 28 mm long) (Duellman. 1978. Misc. Publ. Mus. Nat. Hist. Univ. Kansas 65:1–352). Five adult females collected at Santa Cecilia averaged 104 mm snout–vent length (SVL; range: 91–115 mm; Duellman 1973. Herpetologica 29:228–231). Here, I augment the limited data on this species with observations made in eastern Amazonian Ecuador.

On 31 July 2001, a female *E. cofanorum* was collected resting horizontally on a branch 0.5 m above ground in primary terra firme forest at the Tiputini Biodiversity Station (0°37'05"S, 76°10'19"W; elev. 215 m). This field station, managed by the Universidad San Francisco de Quito, is located 280 km ESE of Quito on the north bank of the Tiputini River next to Yasuni National Park, Orellana Province, Ecuador (Cisneros-Heredia 2003. *In* De la Torre and Reck. [eds.], Ecología y Ambiente en el Ecuador: Mem. I Congr. Ecología y Ambiente, Ecuador País Megadiverso. CD. Universidad San Francisco de Quito, Ecuador). The lizard was gravid and dissection revealed five shelled eggs. Eggs had a mean length of 25.6 mm (24.9–26.0 mm), a mean width of 10.4 mm (10.0–11.3 mm), a mean mass of 1.8 g (1.7–1.9 g; total clutch mass = 9.1 g), and a mean volume of 1.5 cm^3 (1.4–1.7 cm^3). The lizard was 95.7 mm SVL, 120.8 mm tail length, and mass (without eggs) of 27.9 g. The female and eggs (DFCH-USFQ 0558) were deposited at the Universidad San Francisco de Quito.

Based on these data, clutch size in *E. cofanorum* ranges from 2 to 5. This range is smaller, but overlaps that of *E. laticeps*, a sympatric arboreal/terrestrial congener with larger clutches (5–7 eggs, mean = 6.2), smaller eggs (15.0–16.6 mm, mean = 15.6 mm) and larger females (107–125 mm SVL, mean SVL = 114 mm; Duellman 1978, *op. cit.*; Vitt and De la Torre 1996. Research Guide Lizards of Cuyabeno. Mus. Zool. QCAZ-PUCE Monogr. 1:1–165).

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EUMECES FASCIATUS (Five-lined Skink). **PREDATION**. Terrestrial predators pose a risk to many lizards; however, aquatic predators might also threaten terrestrial lizards that use the edges of aquatic habitats (Pianka and Vitt 2003. Lizards: Windows to the Evolution of Diversity. Univ. California Press, Berkeley. 333 pp.). Here, I report a predation event by a fish on *Eumeces fasciatus*.

At 1120 h on 31 July 2002, while fishing in Bay Creek, Pope County, Illinois (37°31'21"N, 88°39'15"W; elev. 164 m), I caught an adult (ca. 140 mm fork length) long-eared sunfish (*Lepomis megalotis*) that had eaten a juvenile *E. fasciatus* (29.2 mm SVL). The skink, still in the buccal cavity of the fish, appeared to have been recently consumed.

Known predators of *E. fasciatus* include various birds, mammals, snakes, and other lizards (Fitch 1954. Univ. Kansas Publ. Mus. Nat. Hist. 8:1–156), but predation by fish is unreported. Fish are atypical predators as *E. fasciatus* usually occupies forested habitats (Smith 1961. Illinois Nat. Hist. Surv. Bull. 28:1–298). The surrounding habitat of Bay Creek is oak-hickory forest and *E. fasciatus* is common on exposed rocks bordering the creek. The *L. megalotis* was caught along the bottom edge of a 10–12 m vertical sandstone cliff at a point where the creek undercut the rock. The skink likely fell into the water from the steep rock escarpment above the creek and was then consumed.

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GAMBELIA WISLIZENII (Long-nosed Leopard Lizard). **NECROPHILIA**. Reports of mating or attempted mating with a dead conspecific or heterospecific individual are limited to the monogamous Australian skink, *Tiliqua rugosa* (How and Bull 1998. Herpetol. Rev. 29:240) and the Brazilian snake, *Tachymenis brasiliensis* (Amaral 1932. Mem. Int. Butantan 7:91–94). Here, I describe an occurrence of this behavior in *Gambelia wislizenii* from west-central Nevada, USA.

On 23 June 2004 at midday during color-manipulation experiments to investigate the role of breeding coloration in mate choice, I observed a male *G. wislizenii* attempting to mate with a brightly colored road-killed female in the South Magazine area of the Hawthorne Army Depot (HWAD), Hawthorne, Mineral Co. (38°30'0.8.3"N; 118°37'16.7"W; elev. ca. 1350 m). Judging from the carcass, the female had probably been killed within a few hours, but was clearly dead (her intestinal tract had been expelled from the impact and ants had begun scavenging the carcass). When found, the male was biting the right shoulder of the dead female, a behavior that is performed to initiate copulation (K. Fallahpour, unpubl. data). I watched the pair from a distance of 2–3 m for 5 min. The male froze in position and watched me for the duration of the observation. Thereafter, I approached the pair slowly and attempted to separate the male from the dead female by nudging him with a metal rod. After ca. 1 min of trying to separate them, the male dragged the dead female about 3 m away under a shrub on the road edge. At this point, the dead female was lying on her back, but the male maintained his grasp of her shoulder with his mouth. After an additional 5 min no other behavior was observed. I then approached the male again and began nudging him in an attempt to separate the pair. He released the female but remained next to her. I then introduced the male to a previously captured female *G. wislizenii* that was painted white to mask her breeding coloration. I placed the female ca. 1 m from the male using a cotton-thread harness attached to a thin monofilament line tethered to a fishing pole. The male immediately approached the tethered female and courted her: tongue flicked her, crawled on top of her, and bit her on the neck in an apparent attempt to initiate copulation. This continued for ca. 5 min. I then separated the two by removing the female. The male immediately ran back to the dead female, circled around her once, and bit her neck again. I watched him for an additional 5 min as he continued to attempt to copulate with the dead female.

During the breeding season, female *G. wislizenii* develop vibrant red-orange coloration on the sides of the head, body, and the ventral side of the tail (Montanucci 1967, Herpetologica 23:119–126). This bright coloration is absent in males and has been suggested to play a role in mate-choice decisions such as sex recognition, courtship stimulation, courtship rejection, or aggression avoidance (Cooper and Greenberg 1992, *In* Gans and Crews [eds.], Biology of the Reptilia, Vol. 18, pp. 298–422. Univ. Chicago Press, Chicago, Illinois). However, the role of breeding coloration in *G. wislizenii* has not been tested empirically, and anecdotal observations (summarized in Cooper and Greenberg, *op. cit.*) provide conflicting interpretations (receptive vs. unreceptive to mating). During this observation, the male attempted to copulate with a colored female just as readily as with a plain female. This would seem to support the hypothesis some investigators have suggested, i.e., that female breeding coloration in *G. wislizenii* might not be important to male mate selection (Fallahpour and Espinoza 2004. Integ. Comp. Biol. 43:847; Moore 1983. The Function of Orange Breeding Coloration in the Social Behavior of the Long-nosed Leopard Lizard [*Gambelia wislizenii*]. MS Thesis, Oregon State Univ., Corvallis, Oregon).

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GONATODES HUMERALIS **(NCN). OVIPOSITION SITE.** Most studies of reproduction in Brazilian lizards focus on the ecological aspects of the reproductive cycle. Oviposition sites are infrequently described. Among Amazonian *Gonatodes*, oviposition data exist only for *G. humeralis*. Eggs have been found behind loose bark on a tree trunk or base, between roots and among dead leaves, in termite nests, hidden below the surface in fine organic debris, concealed in a space below a stone, or in the hollow of a partly decayed tree branch (Avila-Pires 1995. Lizards of Brazilian Amazonia [Reptilia: Squamata]. Zoologische Verhandelingen. 706 pp. and references therein). Here, we describe a previously unrecorded oviposition microhabitat for *G. humeralis* in NE Brazil. Between 27 February and 11 March 2004, we found 10 eggs in the axils of five bromeliads (species not identified) in a mesophyllous secondary forest in the municipality of Urbanos Santos (3°12'28"S; 43°24'12"W; elev. 41 m), state of Maranhão. We found 1–3 *G. humeralis* eggs in each bromeliad (mean = 2; SD = 1), laid 15–23 cm (mean = 20 cm; SD = 2.6 cm; N = 10) above the ground. The eggs averaged 0.17 g in mass (SD = 0.02, range: 0.13–0.20), 7.4 mm in length (SD = 0.3, range = 7.0–8.0), and 6.4 mm in width (SD = 0.2; range: 6.0–6.6). The eggs were incubated in plastic containers and moistened every two days. Nine of the eggs hatched between 22 April and 01 May 2004; all were identified as *G. humeralis*. Hatchlings averaged 16.3 mm SVL (SD = 0.5, range: 15.5–16.9) and 0.13 g in mass (SD = 0.02, range: 0.11–0.15). The hatchlings were released after measurement.

FIG. 1. *Gonatodes humeralis* egg in a terrestrial bromeliad axil.

Leaves of the oviposition bromeliads were characterized by sharp thorns along their margins (Fig. 1), which might provide protection for the eggs of *G. humeralis* against some predators. Accumulated water in these bromeliad axils also created a humid microhabitat that might minimize the risk of egg desiccation. Thus, the axils of some terrestrial bromeliads axils might offer a favorable incubation microhabitat for *G. humeralis* eggs. Data exist on *G. humeralis* using bromeliads at night (Nunes 2002. Ecologia da Floresta Amazônica-Curso de Campo, PDBFF-INPA, Manaus, 2[nd] ed., 163 pp.) and during the day up to heights of ca. 9 m (as *G. annularis*: Beebe 1944 cited in Avila-Pires 1995, *op. cit.*), but this is the first report of *Gonatodes* laying eggs in terrestrial bromeliads.

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HEMIDACTYLUS MABOUIA (Tropical House Gecko). **PREDATION.** According to Vaughan (1976. J. Mammal. 57:227–248), the Heart-nosed Bat (*Cardioderma cor*) preys mainly on

FIG. 1. Heart-nosed bat, *Cardioderma cor*, eating a *Hemidactylus mabouia*. Photo by Leigh Ecclestone.

large, ground-dwelling beetles, but centipedes and scorpions and occasionally small bats are also consumed. Here, we report a direct observation of one Heart-nosed Bat feeding on a *Hemidactylus mabouia*.

While working on an informational exhibit on the harmless snakes of Kasigau at the Taita Discovery Center (TDC), Edwin Selempo, head naturalist for the TDC, heard the unmistakable sound of small bones being crunched overhead. Just 3.5 m above us was a *C. cor* hanging by its hindfeet from the thatch roof, munching on the hindquarters and tail section of what was left of a *H. mabouia*. By the time DW retrieved his camera, just the tail section above the cloaca could be seen protruding from the bat's mouth (Fig. 1). We watched the bat consume most of the tail as it flew from one part of the ceiling to another, avoiding two other heart-nosed bats attempting to steal the, as yet, uneaten tail. Observations were made at 0800 h on 30 July 2004, under the roof of an open-air classroom at the Taita Discovery Center, Rukinga Ranch, Taita/Taveta District-Coast Province, Kenya.

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HOPLODACTYLUS MACULATUS (Common Gecko). **AGGREGATIONS**. Aggregative behavior has been observed in many squamate lineages (e.g., Brattstrom 1974. Amer. Zool. 14:35–49; Cooper and Gartska 1987. Copeia 1987:807–810; Gregory 2004. Herpetologica 60:178–186). However, lizard aggregations in diurnal retreat sites are rarely documented (Shah et al. 2003. Behaviour 140:1039–1052). Hence, we report here on the demographic structure of an unusually large (N = 94), diurnal aggregation of *Hoplodactylus maculatus* on a New Zealand island. On 17 May 2004 (autumn), we surveyed the *H. maculatus* occupying wooden, pest-control bait boxes as diurnal retreat sites. The bait boxes, deployed on the shoreline of Mana Island (40°40'S, 174°00'E) to control accidental rodent (e.g., *Rattus* sp.) incursions, ranged in size from 8.3 to 12.4 L, each with an internal central 0.5 L bait partition where the geckos commonly congregated beneath the bait holder. Fourteen bait boxes were surveyed between 1000 and 1500 h.

A total of 183 *H. maculatus* were found within the 14 bait boxes, with a mean of 13 ± 6 SE geckos per box. However, one bait box contained about half (N = 94) of all geckos captured, and two lacked geckos entirely. The aggregation of 94 geckos (39 juveniles, 11 males, 44 females) was very densely packed within the 0.5 L partition of the bait box, filling the entire area to capacity. Snout–vent length of adult males was slightly larger than adult females (72.7 ± 0.7 and 69.0 ± 0.7 SE mm respectively; $F_1 = 10.330$, $p = 0.002$) and did not differ between the large and smaller aggregations ($F_1 = 2.015$, $p = 0.160$). Overall, 36% of geckos in bait boxes were juvenile or sub-adult, 16% adult males and 48% adult females. The adult sex ratio varied substantially among bait box aggregations (range = 1:7 to 2:0 m:f). The only other lizard species found within the bait boxes was the skink *Oligosoma lineoocellatum*, one of which was found in a bait box with six *H. maculatus*, but not within the bait partition containing geckos.

Hoplodactylus maculatus, a moderate-sized (to 82 mm SVL) widespread, endemic, nocturnal gecko (Gill and Whitaker 2001. New Zealand Frogs and Reptiles, David Bateman, Auckland, New Zealand. 112 pp.), is frequently observed in diurnal aggregations. However, few aggregations have been documented, and details and measurements of aggregations have not been reported. For example, on Stephens Island, Cook Strait, up to 200 individuals were found beneath a corrugated iron sheet (Bauer 1990. Phylogenetic Systematics and Biogeography of the Carphodactylini [Reptilia: Gekkonidae]. Bonn. Zool. Monogr. 30, 217 pp.) and on Mana Island mixed age and sex groups of 10–15 individuals are common, with occasional large aggregations of >60 individuals (Whitaker 1993. Unpubl. report, New Zealand Department of Conservation, Wellington, New Zealand. 53 pp.).

Hoplodactylus maculatus is unlikely to aggregate because of a lack of suitable retreat sites, as the shore platform provides a complex habitat of rocks and logs that could be readily used. Aggregation, despite an abundance of retreat sites, could imply that the benefit may derive from social groups (Shah et al., *op. cit.*). However, the high variance in adult sex ratios suggests that aggregations may not always represent family groups or harems. Aggregative behavior in the nocturnal gecko *Nephrurus milii* might have evolved to provide facultative control over rates of thermal exchange (Shah et al., *op. cit.*), which offers a possible explanation for aggregations of *H. maculatus*. Other *Hoplodactylus* species have also been observed to aggregate in mixed size and sex class groups, including *H. duvaucelii* (Robb 1980. New Zealand Amphibians and Reptiles in Colour. Collins, Auckland, New Zealand. 128 pp.) and *H.* sp. 'Otago-Southland large' (Southey 1986. Unpubl. report, New Zealand Wildlife Service, Queenstown). Aggregation might be widespread and frequent in the genus *Hoplodactylus,* but its purpose needs clarification.

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LEIOCEPHALUS CARINATUS ARMOURI (Northern Curly-tailed Lizard). **ENTANGLEMENT IN HUMAN-MADE MATERIALS**. Reports exist of reptiles caught in persistent, man-made debris. These materials result in deformity or death to freshwater turtles (Dietz and Ferri 2003. Herpetol. Rev. 34:56; McLeod 1994. Herpetol. Rev. 25:116–117; Odum 1985. Herpetol. Rev. 16:113) or tortoises (Engeman et al. 2004. Herpetol. Rev. 35:54–55); entanglement, injury, and death to upland snakes (see review in Stuart et al. 2001. Herpetol. Rev. 32:162–164); and, entanglement and death to desert lizards (Stuart et al., *loc cit.*). Here we add to these reports with an observation of *Leiocephalus carinatus armouri* found entangled in a metal ring.

At ca. 0830 h, 26 October 2003, a sunny day with a temperature ca. 25°C, one of us (CLD) observed an adult (71.0 mm SVL) *L. c. armouri* with a metal ring (22 mm exterior diameter, ca. 17–18 mm interior diameter) caught around its body just forward of the

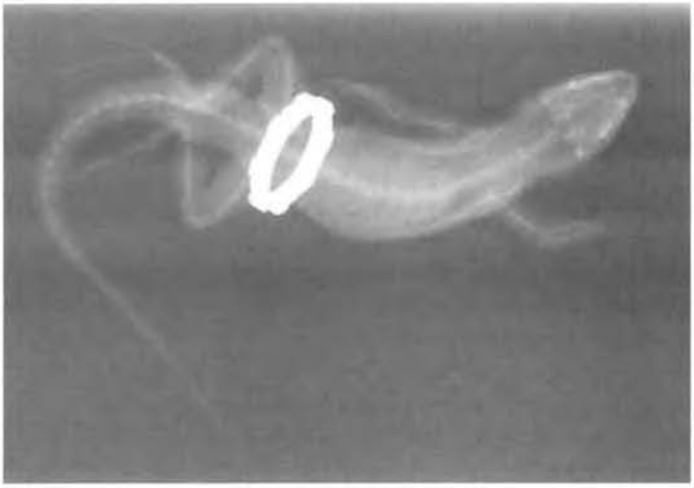

FIG. 1. Radiograph of *Leiocephalus carinatus armouri* entangled in a metal ring.

pelvic girdle (Fig. 1). The site was the parking lot of "Loggerhead Plaza" (14255 US Highway 1 in Juno Beach [Palm Beach Co.], Florida). The town of Juno Beach is within a relatively contiguous 90 km of the surveyed, occupied range of this exotic species in Florida (Smith and Engeman 2003. Florida Park Service Tech. Rep., Hobe Sound, Florida; Smith et al. *In press*. International Biodeterioration and Biodegradation).

The lizard was first observed basking on a curb in the parking lot. Under normal conditions, *L .c. armouri* is very fast fleeing when making an escape to a burrow or other refugium (Smith and Engeman, *loc. cit.*; Meshaka et al. 2004. The Exotic Amphibians and Reptiles of Florida, Krieger Publishing Company, Malabar, Florida. 166 pp.). Although this lizard attempted to elude capture, mobility was hindered by the metal ring, and it was unable to fully extend its hind legs, causing it to drag the distal portion of its body.

We thank D. Hitzig, Busch Wildlife Sanctuary, for the radiograph of the specimen, and E. Cowan, Florida Park Service, for converting the radiograph to electronic format.

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MICROLOPHUS QUADRIVITTATUS (NCN). **CANNIBALISM.** *Microlophus quadrivittatus* is a lizard restricted to the southern part of the coastal desert in Peru (Carrillo and Icochea 1995. Pub. Mus. Hist. Nat. UNMSM 49:1–27). Its diet consists of intertidal invertebrates, marine algae, and some dipterans (Donoso-Barros 1966. Reptiles de Chile. Ediciones Univ. Chile, Santiago. 458 pp.; Perez and Jahncke 1998. Bol. Inst. Mar del Peru 17:81–86), but cannibalism is unreported. Here, we provide the first report of cannibalism in this species.

At 1200 h on 23 March 2000, we captured an adult male *M. quadrivittatus* (146 mm SVL, 85 g, MHNSM 18598) among rocks near the sea shore at Coles Point (17°42'S; 71°22'W; elev. 5 m), Departamento de Moquegua, Peru. The stomach of the adult male *M. quadrivittatus* contained a conspecific juvenile (ca. 70 mm SVL, 8.9 g., MHNSM 18599). The juvenile lacked apparent bite marks, but its tail was partially broken. Additionally, we examined the stomach contents of 20 other *M. quadrivittatus* from this same locality, but this was the only record of cannibalism among them (unpubl. data).

Adults and juvenile of *M. quadrivittatus* show differences in their microhabitat use that would reduce opportunities for cannibalism (Donoso 1948. Bol. Mus. Nac. Hist. Nat. 34:213–216), but the frequency of this phenomenon remains unknown.

Both specimens were deposited in the Department of Herpetology collection of the Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos, Lima, Peru. We thank Carlos Frederico D. Rocha and Edgar Lehr for beneficial comments on versions of this manuscript.

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NEOSEPS REYNOLDSI (Sand Skink). **LONGEVITY**. Skinks in general are relatively long-lived (e.g., *Eumeces fasciatus* can live up to 10 years; Fitch 1965. Univ. Kansas Mus. Nat. Hist., Misc. Publ. [42]:1–60). Fossorial skinks have exceptionally low metabolic rates (Andrews and Pough 1985. Physiol. Zool. 58:214–231; Withers 1981. Copeia 1981:197–204) and thus might be expected to be particularly long-lived. *Neoseps reynoldsi* is a fossorial skink for which estimates of longevity range from 3 (Telford 1959. Copeia 1959:110–119) to 7 years (Sutton 1996. MSc thesis, Univ. of South Florida, Tampa. 45 pp.). Here, we present mark-recapture information on a *N. reynoldsi* from Archbold Biological Station, Highlands Co., Florida that exceeds previous estimates of longevity.

On 11 March 2002, we captured a marked (left foreleg removed) *N. reynoldsi* (62 mm SVL, 1.3 g) under a coverboard. During 1994 an individual (54 mm SVL) at this study site was given this mark. No individuals at this site have been marked since 1994. *Neoseps reynoldsi* have greatly reduced limbs with one (forelegs) or two (hindlegs) small digits per foot. That the mark was from natural loss is unlikely because, 1) the entire left foreleg was removed, and 2) of ~100 *N. reynoldsi* captured by KGA none has ever been missing entire limbs. Mark-recapture data suggest that *N. reynoldsi* reach 54 mm SVL in the second or third year of life (Sutton, *op. cit.*). If this individual was at least two years old in 1994, it must be at least 10 years old now. The long life span of *N. reynoldsi* might be explained in part by life history (clutch size of two, reproducing at most once/year; Ashton, unpubl. data) and physiological correlates of fossoriality (i.e., low metabolic rate; Andrews and Pough, *op. cit.*; Withers, *op. cit.*).

Permit WX01623 from the Florida Fish and Wildlife Conservation Commission to KGA made these observations possible.

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OLIGOSOMA LINEOOCELLATUM (Spotted Skink). **LONGEVITY, SITE FIDELITY.** New Zealand reptiles are widely known for their great longevity and low reproductive output (Cree 1994. New Zealand J. Zool. 21:351–372; Daugherty et al. 1993. TREE 8:437–442). For example, Tuatara (*Sphenodon punctatus*) have a minimum longevity of 81 yrs (N. Nelson, pers. comm.), geckos (*Hoplodactylus duvaucelii* and *H. maculatus*) live for at least 36 yrs (Thompson et al. 1992. J. Royal Soc. New Zealand 22:123–130; Bannock et al. 1999. New Zealand J. Ecol. 23:101–103), the skink *Cyclodina whitakeri* has a minimum longevity of 16–18 yrs (Towns and Ferreira 2001. Biol. Cons. 98:211–222), and the skink *Oligosoma suteri* can live for a minimum of 12 yrs (Towns and Ferreira, *op. cit.*). However, conclusions about the generality of great longevity in New Zealand reptiles are based on limited data; few records exist for many free-living reptile species because of the lack of long-term mark-recapture studies on many New Zealand reptiles. Here, we augment longevity information on New Zealand reptiles with a report for the spotted skink, *O. lineoocellatum*.

During studies of skink habitat use, *O. lineoocellatum* were individually marked on two Cook Strait islands: North Brother Island in 1999 (Phillpot 2000. MSc thesis. Victoria University of Wellington) and Stephens Island in 1991–1992 (East et al. 1995. New Zealand J. Zool. 22:249–261). Six of the 332 skinks marked on North Brother Island were recaptured by JMH in 2004. All six skinks recaptured were marked as adults in 1999 (SVL > 62.1 mm; Spencer et al. 1998. New Zealand J. Zool. 25:457–463). As New Zealand skinks are thought to take ca. 3 yrs to reach maturity (Whitaker 1976. Forest and Bird 202:8–11), our most conservative estimate of longevity for *O. lineoocellatum* is 8 yrs in the wild. New Zealand lizards often exhibit strong site fidelity (e.g., Barwick 1959. Trans. Royal Soc. New Zealand 86:331–380), which is supported by the recapture of five of the six skinks on North Brother Island within 15 m of their initial capture sites. However, one individual was recaptured ca. 60 m from its original capture point, which demonstrates that limited dispersal is possible. On nearby Stephens Island, 360 *O. lineoocellatum* were individually marked in 1991–1992. No marked lizards were recaptured by CLS despite intensive pitfall-trapping at the same sites in November 2002 and March 2003 in which 397 and 340 animals, respectively, were caught in the same grids, and the recapture rate reached 80% by the end of each survey. As these skinks were not permanently marked, it is not possible to investigate site fidelity across seasons. However, during a trapping season, 70% of recaptured skinks (marked by non-permanent marker pen) were recaptured in the same trap, and 96% were recaptured within 7 m of initial capture. Because of strong site fidelity and the capture of a large number of *O. lineoocellatum* during the re-survey, a reasonable chance exists that skinks marked in 1991–1992, and still surviving, would have been recaught. We therefore suggest that maximum longevity in the wild is less than 14 yrs for *O. lineoocellatum*.

Our finding that *O. lineoocellatum* live for 8 to <14 yrs in the wild agrees with findings for other New Zealand skinks (e.g., Towns and Ferreira, *op. cit.*). In comparison to other skinks (e.g., Read 1998. Aust. J. Zool. 46:617–629), New Zealand species are relatively long-lived with low reproductive output, possibly as a result of the physiological limitations of living at colder temperatures (Cree, *op. cit.*) and historical lack of predation by mammals (Daugherty et al., *op. cit.*).

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OPHISAURUS ATTENUATUS LONGICAUDUS (Slender Glass Lizard). **CLUTCH SIZE and BROODING**. Reproductive data among North American glass lizards (*Ophisaurus*) has been obtained largely from *O. ventralis* (e.g., Fitch 1989. Occas. Pap. Mus. Nat. Hist. Univ. Kansas 125:1–50; Vinegar 1968. Bull. California Acad. Sci. 67:65–68; Witz and Wilson 1993. Florida Field Nat. 21:36–37). Except for Fitch (*op. cit.*), who reported clutch sizes of 5–16 for *O. a. attenuatus* in Kansas, and Mount (1975. The Reptiles and Amphibians of Alabama. University of Alabama Press. Tuscaloosa, Alabama. 347 pp.), who noted two gravid *O. a. longicaudus* from Alabama contained 5 and 10 oviductal eggs, reproductive data on *O. attenuatus* are lacking. Hence, here I report the first record of clutch size, egg size, and brooding behavior in *O. a. longicaudus* from Tennessee, USA.

At 1045 h on 2 July 2004, I discovered an adult female slender glass lizard with eggs (Fig. 1) in a depression under a wooden cover board in the southwestern portion of Arnold Air Force Base in Franklin County (35°21'22"N, 86°09'00"W; elev. 335 m). To minimize disturbance, neither the female nor the eggs were physically manipulated; only eggs that could be measured without handling were used to estimate egg size. Using a single data logger-linked thermocouple, air and substrate temperatures were measured at four locations 90° to each other ca. 0.5 m from the nest, and taken ca. 7 cm above and 3 cm below the substrate, respectively. I also obtained a nest temperature by positioning the thermocouple between the eggs and the body of the female.

The nest was located in a young, open Loblolly Pine (*Pinus taeda*) forest with < 25% canopy cover and a graminoid-dominated groundcover. Located ca. 10 m from the edge of an adjacent closed canopy pine forest, the nest was ca. 20 m from a seldom-used gravel road separating this area from a 2-yr-old clear-cut containing early successional vegetation comprised primarily of grasses and woody debris.

The female, ca. 1 m total length, was coiled around eight eggs; three eggs measured were estimated to be 2.3 x 1.4 cm. At 1100 h, the air and substrate were 24.2°C and 25.2°C, respectively. The nest temperature, taken within 1 min of the substrate temperatures, was 26.7°C. The female remained motionless during measurements of egg sizes and temperatures.

Clutch size is within the range reported for *O. attenuatus* (Fitch, *op. cit.*; Mount, *op. cit.*), and both clutch size and egg sizes observed were similar to those for the congeneric *O. ventralis* (Gras-Riedel 1993. Salamandra 28:161–170; Schwab 1992. Herpetol. Rev. 23:60; Witz and Wilson, *op. cit.*). Further, the female being coiled around the eggs is a characteristic part of what has been termed brooding among North American *Ophisaurus* (Mount, *op. cit.*). This behavior is thought to be maintained through hatching in late summer-early autumn (Mount, *op. cit.*), but its function is poorly understood. Smith (1946. Handbook of Lizards: Lizards of the United States and Canada. Comstock Publ. Co., Inc. Ithaca, New York. 557 pp.) suggested that brooding in *Ophisaurus* increases nest temperature, presumably enhancing offspring development. However, given the small temperature differences (0.2–0.4°C) previously observed between the body of the female and the substrate, a thermoregulatory benefit was deemed unlikely (Noble and Mason 1933. Amer. Mus. Novitates 619:1–21; Vinegar, *op. cit.*). My recording of a nest temperature at least 1.5°C higher than the substrate temperature may restore confidence in the thermoregulatory importance of brooding, however demonstration that it enhances embryonic development is needed. Based on female *Ophisaurus* failing to protect their eggs after being exposed to potential nest predators, Noble and Mason (*op. cit.*) concluded that it was also doubtful that females remain with the eggs for the sole purpose of defense. The lack of female response I observed during intrusion to the nest might support this idea, but does not exclude the possibility that remaining with the eggs may deter small predators.

I thank Arnold Air Force Base for providing support for field work.

FIG. 1. An adult female *Ophisaurus attenuatus longicaudus* coiled around a clutch of 8 eggs in Franklin County, Tennessee.

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OPHISAURUS VENTRALIS (Eastern Glass Lizard) **PREDATION.** Atypical encounters can result in opportunistic predation on unusual reptilian prey (Smith and Engeman 2003. Herpetol. Rev. 34:245–246; Woodin and Woodin 1981. Florida Field Nat. 9:64). Using tactile probing, the White Ibis (*Eudocimus albus*) feeds mainly on fiddler crabs and insects, but also selectively consumes crayfish, crabs, insects, and frogs in greater proportions during nesting season (Kushlan and Bildstein 1992. *In* A. Poole and F. Gill [eds.], The Birds of North America. pp. 1–20. The Academy of Natural Sciences, Philadelphia; and AOU, Washington, DC.). Here, we report an instance of predation by White Ibis on an *Ophisaurus ventralis* in southeastern Florida.

At ca. 0845 h, 24 February 2004, a cloudy day with an air temperature ca. 23°C, JAM observed five adult White Ibis foraging in the lawn and sandy patches below a palm tree in a backyard in Vero Beach (27°38.444'N, 80°25.071'W; elev. 4 m). The ibises were soil-probing with their bills when one individual stood up with what was clearly an *O. ventralis* of about 45 cm (total length) in its bill. The ibis tried to reposition the lizard for swallowing when JAM inadvertently disturbed it; consequently, it flew off with the glass lizard still in its bill.

A small colony of *O. ventralis* has existed under the deck of the house, and in the leaf litter in this backyard since at least 2001 (unpubl. data). The event was noteworthy because white ibises are largely crustacean diet-specialized wading birds that were foraging in a terrestrial situation, and captured a fossorial reptile. The typical predators of *Ophisaurus* include snakes, hawks, and carnivorous mammals (Means 1992. *In* Moler [ed.], Rare and Endangered Biota of Florida, pp. 247–250, University Press of Florida, Gainesville; Beane 1995. Wildlife Profiles, NC Wildlife Resources Commission, Raleigh, North Carolina. 2 pp.). Likewise, we know of no similar depredation reports for *O. ventralis* in the literature.

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PHELSUMA LATICAUDA LATICAUDA (Golden Dust Day Gecko). **NECTARIVORY.** *Phelsuma l. laticauda*, a highly territorial, arboreal day gecko endemic to Madagascar and the Comoros Islands, has been introduced to Farquhar Island (southern Seychelles) and Hawaii, where it can reach locally high densities (McKeown 1996. A Field Guide to the Reptiles and Amphibians of the Hawaiian Islands. Diamond Head Pub. Inc. California. 172 pp.). Here, I report on nectar consumption and potential pollination behavior in introduced Hawaiian *P. l. laticauda*.

Between 1600 and 1900 h on 27 July 2001, several *P. l. laticauda* were observed in Kona, on the west coast of the island of Hawaii (19°36'00"N, 155°59'25"W; elev. ca. 30 m), drinking nectar from flowers of *Strelizia nicolai* (Strelitziaceae) and coming in contact with both the stamens and stigmas of *S. nicolai*.

Strelizia nicolai was also introduced to Hawaii from subtropical

South Africa for ornamental purposes (Hensley et al. 1998. Bird of Paradise. Univ. Hawaii Coop. Ext. Pub. OF-27, Honolulu, Hawaii), and the behavior I observed suggests that *P. l. laticauda* has the potential to facilitate its pollination. Flower visitation and pollination in the wild has been reported in other species of *Phelsuma* (Nyhagen et al. 2001. J. Trop. Ecol. 17:755–761 and references therein), and the genus is known to be highly nectarivorous and frugivorous in captivity, a pattern that the appellation "hummingbirds of lizarddom" reflects (Rundquist 1995. Day Geckos. TFH Publications, Inc., Neptune City, New Jersey. 64 pp.). This, together with a largely island-based distribution where the diversity of pollinators is usually low (Olesen and Jordano 2002. Ecology 83:2416–2424), suggests that specialized plant-lizard interactions worthy of research attention might occur in the genus *Phelsuma*.

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SCELOPORUS OLIVACEUS (Texas Spiny Lizard). **ECTOPARASITISM**. The chigger mite *Eutrombicula alfreddugesi*, the most frequent cause of mite infestation in the United States, burrows into the outer skin, producing a characteristic itch and associated inflammation (Potts 2001. Postgrad. Med. 110:57–64). Several studies have documented infestations of this mite in sceloporine lizards (*Sceloporus undulatus*: McAllister 1980. Proc. Arkansas Acad. Sci. 34:125; *S. grammicus microlepidotus* and *S. palaciosi*: Gadsden 1988. Acta Zool. Mex. [n.s.] 30:21–31); however, infestation of *S. olivaceus* is unreported. Here, we report chigger mite parasitism in *S. olivaceus* from northern México.

In October 2003, during a study on the herpetofauna at the Parque Ecológico Chipinque in the municipalities of Garza García and Monterrey, Nuevo León (25°34'50"N, 100°21'55"W; elev. 1365 m), we captured 13 adult *S. olivaceus* with a noose or by hand. Data obtained for each lizard included sex (hemipenal eversion used to identify males), snout–vent length (SVL, to nearest mm), weight (W, with a 30-g Pesola™ spring scale) and the total number of chigger mites carried (T_m). To obtain the latter, we carefully examined lizards, but especially the neck pockets, axillae, and postfemoral pleats. The mites were removed at the place of capture using wetted cotton swabs. The red color of the mites allowed counting them on the surface of the cotton with a magnifying glass and collecting them. Lizards were released at the place of capture. We used Talleklint-Eisen and Eisen criteria (1999. Exp. Applied Acarology 23:731–740) to categorize infestation intensity: low (1–6 mites per individual), moderate (7–15), or high (> 15). A Kolmogorov-Smirnov goodness of fit test revealed SVL, W, and T_m to be normality distributed, so we used t-tests to compare means of SVL, W, and T_m between males and females. We also carried out regression analysis between SVL and T_m, and W vs T_m for both sexes. We assumed all tests to be significant at $a = 0.05$; measurements are reported as mean ± SE.

We captured 13 *S. olivaceus* (7 males and 6 females), all of which carried chigger mites. Mean SVL (86.6 ± 7.1 mm) and W of females (23.5 ± 4.6 g) was significantly greater than the mean SVL (44.8 ± 6.1 mm) and W (5.1 ± 2.7 g) of males (SVL: t = 3.40, $P = 0.007$; W: t = 4.42, $P = 0.001$). Of the 7 males, one each showed a low and a moderate infestation, but in the remainder (71.4%; N = 5), infestation was high. Of the 6 females, half had low and half had high infestations. Mean T_m for males (47.5 ± 12.7; range: 3–100) and females (23.1 ± 10.5; range: 1–60) were similar (t = 1.44; $P = 0.170$). We found no relationship between SVL and T_m for males (r = 0.26; $F_{1,5} = 0.38$; $P = 0.564$; N = 7) and females (r = 0.10, $F_{1,4} = 0.04$; $P = 0.847$; N = 6); or between W and T_m for each sex (males: r = 0.59, $F_{1,5} = 2.72$; $P = 0.164$; N = 7; females: r = 0.70, $F_{1,4} = 3.92$; $P = 0.119$; N = 6). Mites were found exclusively in the neck pockets of males and females.

No significant relationship was found between SVL and W or T_m in males or females, so mite infestation might not reduce the physical condition of *S. olivaceus* as Schall et al. (2000. J. Herpetol. 34:160–163) and Vrcibradic et al. (2000. Herpetol. Rev. 31:174–175) discuss in their respective studies involving *S. occidentalis* and *Geckobiella texana*, and *Mabuya macrorhyncha* and *E. alfreddugesi*. However, our samples were small, and more data will be required to verify the lack of relationship. Mites being concentrated in neck pockets for both sexes supports the idea that neck pockets may be preferred when space exists to attach inside them. This can benefit the host as functionally important areas, like the eardrums and axillae (Salvador et al. 1999. Herpetologica 55:1–7) are not used.

We thank Nixon Wilson (University of Northern Iowa) for confirming the mite identification, Gabriel Mata Flores, Andres Rios Saldaña, and David Aguillón for help in the field, and Marc P. Hayes for suggestions on the manuscript.

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SCELOPORUS UNDULATUS UNDULATUS (Eastern Fence Lizard). **KYPHOSIS AND SCOLIOSIS**. Kyphosis and other malformations of the vertebral column like scoliosis are well known in turtles (e.g., Nixon and Smith 1949. Turtox News 27:28–29; Rhodin et al. 1984. British J. Herpetol. 6:369–373; Stuart 1996. Bull. Chicago Herpetol. Soc. 31:60–61) and occasionally reported for snakes usually as a result of developmental malformations (Frye 1991. *In* Frye [ed.], Biomedical and Surgical Aspects of Captive Reptile Husbandry, Vol. 2, pp. 393–420, Krieger Publ. Co., Mabalar, Florida; Gray et al. 2003. Bull. Chicago Herpetol. Soc. 38:4–6). Most malformations reported for lizards include bifurcations of the tail that usually are results of injuries (Blair 1960. The Rusty Lizard. Univ. Texas Press, Austin, Texas, 185 pp.; Scott 1982. Herpetol. Rev. 13:46; Smith 1946. Handbook of Lizards. Cornell Univ. Press, Ithaca, New York, 557 pp.). Reports of other types of abnormalities are rare. Tinkle (1967. Misc. Publ. Mus. Zool. Univ. Michigan 132:1–182) listed a juvenile female *Uta stansburiana* with a crooked tail, apparently a case of scoliosis. In this note, we describe the first case of a sceloporine lizard with both kyphosis and scoliosis.

On 25 September 2002, we caught a juvenile female *Sceloporus undulatus* (48 mm SVL, 78 mm tail, 6.8 g) on leaf litter in mixed hardwoods and pine adjacent to a vernal pool in the Colonial

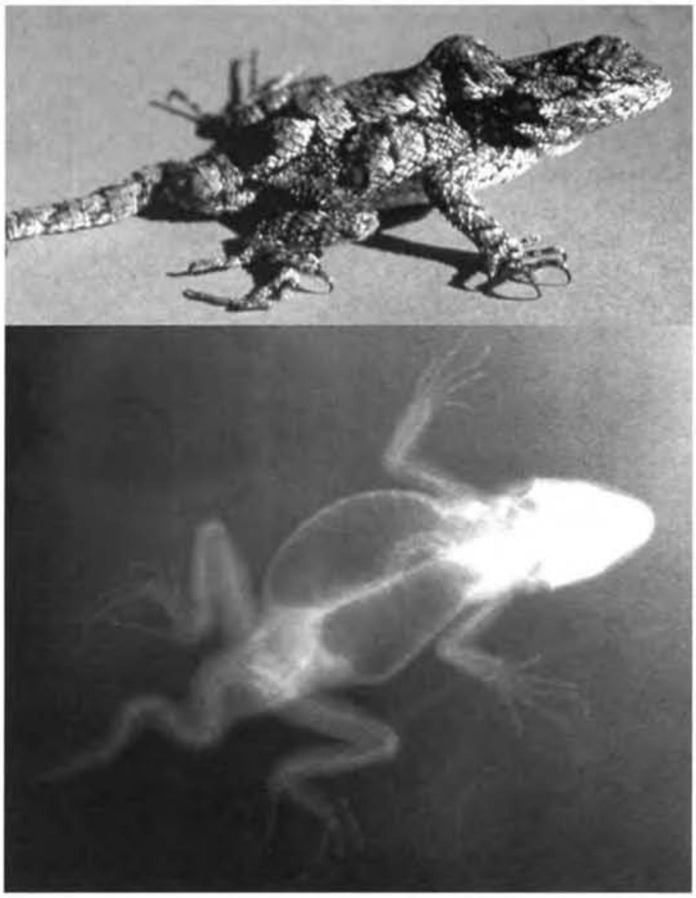

FIG. 1. *Sceloporus undulatus* from Virginia with multiple kyphosis and scoliosis.

National Historical Park, 4.3 km S Yorktown, York County, Virginia (37°11'39"N, 76°30'45"W; elev. 13 m). She exhibited two vertical curvatures of the spine (kyphosis), one behind the pectoral region and one over the pelvic girdle (Fig. 1). The anterior one was also curved to the left and the posterior one was curved to the right. In addition, her tail had three, alternating lateral curves near the base (scoliosis). This lizard experienced no obvious limitations in mobility or prey capture as she was maintained in captivity on live crickets until 19 June 2003. She actively pursued all prey introduced into her cage and grew 14 mm SVL during this period. We released her on that date at the site of capture.

We thank Judy Greene of Savannah River Ecology Lab for helping to secure the radiograph.

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SCINCELLA LATERALIS (Ground Skink). **ARBOREAL BEHAVIOR**. Ground Skinks are active foragers that prey on small terrestrial invertebrates (Brooks 1967. Ecol. Monogr. 37:71–87), but the behavioral ecology of this species is not well known (Akin 1998. Can. J. Zool. 76:87–93). In mixed hardwood forests of eastern North America, Ground Skinks typically are described as being diurnal, generally occurring in leaf litter (Mitchell 1994. The Reptiles of Virginia. Smithsonian Institution Press. 352 pp.). Here, we report an observation of nocturnal foraging in an arboreal microhabitat by this typically diurnal, terrestrial species.

While collecting harvestmen (Arthropoda, Sclerosomatidae) on an undeveloped forested portion on the Virginia Wesleyan College campus, Norfolk/Virginia Beach, Virginia (36°51'52"N, 76°11'34"W; elev. 4 m), we observed an adult (41 mm SVL) male *S. lateralis* actively foraging on small flying insects while climbing a tree. The habitat is mesic mixed hardwood forest with a tree canopy dominated by White Oak (*Quercus alba*), Southern Red Oak (*Quercus falcata*), and Red Maple (*Acer rubrum*); a dogwood (*Cornus florida*) understory; and an herb layer of Poison Ivy (*Rhus toxicodendron*), English Ivy (*Hedera helix*), Sassafras (*Sassafras albidum*), and occasional patches of Mayapple (*Podophyllum peltatum*). Ground Skinks occur, but are infrequent, in this habitat.

On 9 June 2004 at 2100–2115 h EST, we observed a ground skink slowly climbing the trunk of a small (20 cm diam) Black Gum (*Nyssa sylvatica*). When first spotted, the lizard was 80 cm above the ground. Using a red light headlamp, we observed the skink slowly move to a deep scar in the trunk at a height of 122 cm. During its ascent, the skink repeatedly moved its head laterally and tongue flicked frequently. Periodically, tongue flicks were followed by swift head movements that seemed directed at tiny flying insects hovering or landing near the lizard. During our 15-min observation period, the lizard approached several small black ants, juvenile wood roaches, and small harvestmen. It repeatedly attempted to capture the small flying insects, but ignored the larger arthropods. After it stopped climbing, we captured the lizard to measure it and verify its gender. We subsequently released it at the base of the tree.

Our observation is the first report of *S. lateralis* actively foraging at night in an arboreal microhabitat. This observation implies that these lizards might opportunistically climb plants in a manner similar to that reported for other typically terrestrial species, e.g., *Plethodon cinereus* (Jaeger 1978. Copeia 1978:686–691).

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TRACHYLEPIS SPILOGASTER (Kalahari Tree Skink). **ENDOPARASITES.** *Trachylepis spilogaster* occurs in arid savannah from Kimberley and Lower Orange River in Northern Cape Province, through Botswana and Namibia to southern Angola (Branch 1998. Field Guide to Snakes and other Reptiles of Southern Africa, Ralph Curtis Books, Sanibel Island, Florida. 399 pp.). Goldberg and Bursey (2001. Onderstepoort J. Vet. Res. 68:143–147) reported the cestode *Oochoristica truncata* and the nematodaes *Parapharyngodon rotundatus, Spauigodon petersi, Thubinaea fitzsimonsi,* and unidentified ascarid larvae from *T. (Mabuya) spilogaster* from Botswana. The purpose of this note is to report an additional species of Nematoda, *Abbreviata paradoxa,* in *T. spilogaster.*

Coelomic cavities of 334 (201 from Botswana, 133 from Republic of South Africa) were examined for helminths. One female *T. spilogaster* collected 12 May 1970 (73 mm SVL, LACM 80927) from Cape Province, Republic of South Africa contained one nematode. The nematode was cleared in a drop of concentrated glycerol on a glass slide, cover-slipped, examined under a compound microscope, and identified as a female *Abbreviata paradoxa*. It was deposited in the United States National Parasite Collection, Beltsville, Maryland as USNPC (95027).

The physalopterid nematode, *A. paradoxa* is previously known from the scincids, *Trachylepis (Mabuya) occidentalis* and *Trachylepis (Mabuya) striata* from South Africa (Goldberg and Bursey, *op. cit.*), the varanids *Varanus albigularis* from South Africa (Linstow 1908. Denk. Med. Natur. Ges. 13:19–28), *Varanus bengalensis* from India (Baylis 1939. The Fauna of British India, including Ceylon and Burma. Nematoda. Vol. II. Taylor and Francis, London, 408 pp.), and *Varanus griseus* from Russia (Andrusko and Markov 1956. Vest. Leningrad Univ., Biol. Ser. 21:61–71), and the colubrid *Psammophis sibilans* from Sudan (Ortlepp 1922. Proc. Zool. Soc. London 72:999–1107). Members of the nematode family Physalopteridae utilize a wide variety of arthropods as intermediate hosts (Anderson 2000. Nematode Parasites of Vertebrates. Their Development and Transmission, 2nd ed. CABI Publishing, Oxon, U.K. 650 pp.), which the vertebrate host then typically consumes to complete the physalopterid life cycle. *Trachylepis spilogaster* is a new host record for *A. paradoxa.*

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VARANUS CF. GOULDII (Gould's Monitor). **RITUAL COMBAT.** Observations of male-male fighting in free-ranging monitors are rare. In particular, male ritual combat has only been partially described from southwestern Australia (Thompson and Withers 1992. West Austr. Nat. 19:21–29). Here we describe a case of ritual combat in *V. cf. gouldii* from northeastern Australia.

Our observations were made at Castle Hill, Townsville, Queensland (19°15'0"S, 146°48'40"E; elev. 142 m). At 1700 h on 16 January 2004, we came upon two *V. cf. gouldii* engaged in classic varanid ritual combat (*fide* Auffenberg 1994. The Bengal Monitor. Univ. Florida Press, Gainesville, 561 pp., for captive *V. nebulosus*). When first seen the two monitors were in a bipedal stance on the road shoulder (Fig. 1). They were engaged in a brachial embrace, twisting and turning in a wrestling match that continued for ca. 7 min. The lighter-colored male (Male 1) then managed to climb higher on his opponent (Male 2) and push him into the body-arch position (see Auffenberg, *op. cit.*). Within < 2 min Male 1 had pushed Male 2 to the ground on his back, although they still remained in brachial embrace. Male 2 then struggled free, but immediately returned to bipedal stance, and another bout of wrestling began. By this time, road traffic was backing up as a crowd had gathered and several tourists approached the lizards for photo shots. The monitors stopped, apparently noticing the humans for the first time. They dropped to the ground and ran off in the same direction into the nearby eucalypt woodland. Total

FIG. 1. Adult males of *Varanus cf. gouldii* in bipedal stance during ritual combat at Castle Hill, Townsville, Queensland.

observation time was about 15 min.

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SERPENTES

ACRANTOPHIS DUMERILII (Dumeril's Ground Boa). **DIET.** Madagascar is well known for the presence of a conspicuous boid fauna including *Sanzinia madagascariensis*, *Acrantophis madagascariensis*, and *A. dumerilii* (Vences and Glaw 2003. Salamandra 39:181–206). The adults of these species prey mainly upon mammals and birds, whereas juveniles are believed to prey upon lizards and frogs, as is the case for many other boids (Glaw and Vences 1994. A Fieldguide of the Amphibians and Reptiles of Madagascar. Vences and Glaw Verlag, Cologne. 480 pp.). Here we report predation by *Acrantophis dumerilii* on an insect. On 22 January 2004 at 2130 h we found a female *A. dumerilii* within the Isalo Massif in central-southern Madagascar next to Ilakaka (Ranohira Fivondronana, Fianarantsoa Faritany, 22°49.85'S and 45°17.75'E, 680 m elev.). The snake (ca. 1700 mm TL, and ca. 3.5 kg) was coiled around its prey, on the dry bed of an intermittent river. We delicately unrolled the specimen and discovered a Madagascan Giant Hissing Cockroach, *Gromphadorhina* *portentosa* (Museo Regionale di Scienze Naturali, MRSN-FAZC 11962). The roach measured 70 mm TL and weighed 10 g. Our observations suggest that giant hissing cockroaches are quite common in this area. Predation by large constrictors upon insects was until now undescribed, and this observation suggests that *A. dumerilii* opportunistically forages.

We thank Jasmin E. Randrianirina for assistance and the Nando Peretti Foundation for funding.

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ADELPHICOS QUADRIVIRGATUS NEWMANORUM (Newman's Earth Snake). **PREDATION.** Invertebrate predation on snakes has only infrequently been documented or photographed (Bayliss 2001. Herpetol. Rev. 32:49; Greene 1988. *In* Gans and Huey [eds.], Biology of the Reptilia, Vol.16, Ecology B, Defense and Life History, pp 1–152. Alan R. Liss, New York; Hill and Phillipps 1981. A Colour Guide to Hong Kong Animals. Government Printer, Hong Kong. 281 pp.; Mayne and Babb 2004. Herpetol. Rev. 35:399; McCormick and Polis 1982. Biol. Rev. 57:29–58; McKeown 1963. Australian Spiders. Angus and Robertson, Sydney. 287 pp.; Owens 1949. Herpetologica 5:148). One author found a snake in a spider web (Zippel and Kirkland 1998. Herpetol. Rev. 29:46). Here we describe a spider feeding on a snake carcass.

The following observations were made 19 June 2003 during a herpetological survey in the Sierra Madre Oriental in the Area Natural Protegida La Estanzuela (25°31'54"N, 100°16'38"W; 900 m elev.), near Monterrey, Nuevo Leon, México. A dead female *Adelphicos quadrivigatus newmanorum* (UNAL 6233; 370 mm TL) was found suspended in a spider's web about 20 cm above a small, nearly perennial stream (ca. 1–3 m wide and 60–150 cm deep). An adult female *Dolomedes tenebrous*, an aquatic spider in the family Pisauridae, was eating the snake's carcass. Pisaurid spiders (Nursery Web or Fishing Spiders) run across water surfaces and dive after prey. They live near the banks of creeks and ponds. The spider had consumed much of the snake's flesh in an area extending from ca. 33 to 40 mm posterior of the snout. This specimen represents only the second *A. q. newmanorum* collected in the state of Nuevo Leon (Contreras 1989. Publ. Biol. Fac. Ciencias Biol., Univ. Auton. Nuevo Leon 3:35–36). We thank Wade C. Sherbrooke for reviewing this note.

FIG. 1. *Dolomedes tenebrous* consuming *Adelphicos quadrivigatus.*

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AGKISTRODON PISCIVORUS (Western Cottonmouth). **FORAGING BEHAVIOR**. In a drained reservoir on Loggy Bayou Wildlife Management Area (Bossier Parish, Louisiana, USA) on 24 May 2004 we startled a young-of-the-year (40–60 mm) *Rana sphenocephala* (Southern Leopard Frog). During its escape the frog crossed the path of a 400–500 mm *Agkistrodon piscivorus*. The snake seized the frog in mid-air. One of us (MLM) lightly tapped the snake's rostrum with a snake stick and it released the frog, which jumped away without apparent ill effects. The ability to capture a moving airborne prey item provides important information regarding the biomechanical aptitude and foraging behavior of pitvipers. The lack of noticeable venom effects on the frog suggests that some pitvipers might not envenomate some types of prey. Because frogs do not pose a danger to snakes during prey handling, envenomation would not provide any protective benefits to the snake during prey handling, although envenomation might decrease the risk of losing prey.

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ALSOPHIS RUFIVENTRIS (Red-bellied Racer). **FORAGING AND DIET**. Despite being widespread in the West Indies, little has been recorded regarding foraging behavior in the colubrid genus *Alsophis*. *Alsophis rufiventris* occurs on Saba and St. Eustatius and has been extirpated on St. Christopher and Nevis. From 3–24 June 2004, we observed four feeding events by *A. rufiventris* on The Quill, a dormant volcano on St. Eustatius. We twice saw snakes eating *Anolis schwartzi*. During one of those encounters, the snake began ingestion before the lizard was completely immobilized. The entire feeding event took ca. 2 min. The second encounter occurred on the rim of The Quill. The snake was on a fallen log about 1 m above the substrate when it struck at something under the leaves of a dead bromeliad. We disturbed the snake by lifting the leaves for a closer look, and the snake fled with an adult *A. schwartzi* in its mouth. We also saw two instances of snakes eating reptilian eggs (most likely those of *A. schwartzi*). In one instance, a snake was tongue-flicking in leaf litter at a single spot for several minutes, until it grasped and swallowed a small white egg. In the other instance, we disturbed a snake that had been rooting in litter. It dropped a collapsed reptilian egg as it fled.

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AMPHIESMA STOLATUM (Striped Keelback). **PREY SIZE**. At 0946 h on 16 July 2003, a male *Amphiesma stolatum* (430 mm SVL, 35.66 g) was found ingesting a Spectacled Toad (*Bufo melanosticus*; 55 mm SVL, 14.07 g) on the tiled entrance of the Biological Resource Department building of National Chiayi University, Taiwan (23°28'18"N, 120°29'04"E). The toad was being consumed vent first, and the head and forelimbs were protruding from the snake's mouth. At first the snake tried to flee with the prey item in its mouth. It moved ca. 40 cm and then regurgitated the toad in an attempt to escape.

Published records suggest *A. stolatum* has a broad diet, including insects, amphibians, fish, earthworms, lizards, and scorpions (Das 2002. A Photographic Guide to Snakes and Other Reptiles of India. New Holland Publishers Ltd., London. 19 pp.). Colubrids commonly prey on creatures about 20% of their own mass (Greene 1997. Snakes: The Evolution of Mystery in Nature. University of California Press, Berkeley. 351 pp.), but in this case the prey/predator mass ratio was 39.5%. To our knowledge this is the largest recorded predator/prey mass ratio for this species.

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ANILIUS SCYTALE (Red Pipesnake). **CANNIBALISM.** Cannibalism is a common occurrence among reptiles (Polis and Myers 1985. J. Herpetol. 19:99–107). *Anilius scytale*, a South American aniliid, is found in Venezuela, Guyana, French Guiana, and Suriname, and Amazonian portions of Colombia, Ecuador, and Brazil (Cunha and Nascimento 1993. Bol. Mus. Emílio Goeldi 9:1–191). Primarily fossorial and occasionally aquatic and terrestrial when active, it is almost always associated with water bodies (Martins and Oliveira 1998. Herpetol. Nat. Hist. 6:78–150). Anecdotal information indicates *A. scytale* feeds primarily on elongate fossorial and aquatic vertebrates (Beebe 1946. Zoologica 31:11–52; Greene 1983. Amer. Zool. 23:432–441), including an observation of feeding on *Atractus torquatus* (Martins and Oliveira, *op. cit.*). A preserved adult male *A. scytale* (MPEG 7243; 430 mm CRC), from the municipality of Capitão Poço (01°44'41"S, 47°03'54"W), Pará, Brazil, contained a conspecific juvenile male (315 mm CRC), ingested head first. The prey represents 74.1% of the predator's total length. This is the first report of cannibalism for *A. scytale*. The low incidence of cannibalism in the *Anilius scytale* (as well as in other species of snakes and lizards) suggests that the predator might not discriminate between conspecifics and other prey items when opportunistically foraging (Pontes et al. 2003. Herpetol. Rev. 34:154).

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ATRACTASPIS IRREGULARIS (Mole Viper or Stiletto Snake). **REPRODUCTION**. *Atractaspis irreglaris* is distributed through east, central, and west Africa (Chippaux 2001. Les Serpents d'Afrique Occidentale et Centrale. Collection Faune et Flore Tropicales 35. Institut de Recherche pour le Développement Editions, Paris. 292 pp.; Spawls et al. 2002. A Field Guide to the Reptiles of East Africa. Academic Press, London. 543 pp.). In east Africa, mating has been observed in September and six eggs were reported in a specimen from Uganda (Spawls et al. 2002, *op. cit.*). In March 2004, we captured a gravid female *A. irregularis* in a garden in Yaoundé, Cameroon (3.5°N, 11.5°E) that subsequently laid three eggs on 8 April 2004. The eggs were measured in the week following oviposition, they had a mean length of 49 mm (SD = 7.8, range = 43–58). The eggs were incubated in a sealed plastic container on moistened dry grass. The temperature in the container ranged from 26.0–29.1°C and the humidity from 61–100%. The eggs hatched sometime between 21 and 29 June 2004. The hatchlings averaged 6.83 g in mass (0.59 SD, range = 6.00–7.25), 209.7 mm SVL (0.39 SD, range = 206–215), and all three had 16 mm long tails.

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BOIGA DENDROPHILA (Mangrove Snake). **DIET**. The diet of *Boiga dendrophila* includes a diversity of vertebrates, including lizards, snakes, birds, and mammals (Greene 1990. Proc. California Acad. Sci. 46:193–207). Herein I report a novel species and order (Scandentia) in the diet of *B. dendrophila*. While radio-tracking a Large Treeshrew (*Tupaia tana*; 190–240 g) on the morning of 18 September 2003 at the Danum Valley Field Center in northeast Borneo (4°58'N, 117°48'E), I found a large *B. dendrophila* coiled around a tree branch ca. 5 m off the ground. I determined that the radio signal of the *T. tana* was emanating from the general location of the *B. dendrophila*, which was noticeably distended at mid-body. Neither the snake nor the radio signal moved the rest of that day. The next day the snake had moved ca. 100 m and was found by tracking the radio signal. After a third day, neither the signal nor the snake could be located despite a thorough search. *Tupaia tana* is one of the most numerous diurnal mammals in lowland Bornean rainforests (45–55 individuals/ km^2; Emmons 2000. Tupai: A Field Study of Bornean Treeshrews. Univ. California Press, Berkeley. 269 pp.) and might represent a significant component of the diet of *B. dendrophila* on Borneo. I thank H. W. Greene for reviewing this manuscript.

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BOIGA KRAEPELINI (Taiwanese Tree Snake). **DIET**. *Boiga kraepelini* is the only member of this genus that naturally occurs in Taiwan, where it inhabits low to medium elevation habitats island-wide. At 0800 h on 28 March 2003 an adult female *B. kraepelini* (1318 mm TL) was found dead on the side of a road next to an electrical pole, near the main entrance of the Taitung Animal Propagation Station (22°49'08"N, 121°04'58"E, elev. 132 m). Upon dissection we found a 32.7 g dove chick in the specimen's stomach. The chick is probably either a Red Turtle Dove (*Streptopelia tranquebarica*) or a Spotted Dove (*Streptopelia chinensis*), both of which are very common in this area. *Boiga kraepelini* is known to prey on a variety of vertebrates, including birds, lizards, and mice (The Transition World - Guidebook of Amphibians and Reptiles of Taiwan. SWAN, Taipei, pp. 176–177). To the best of our knowledge, this is the first report of predation by *B. kraepelini* on a dove chick.

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BOTHRIECHIS SCHLEGELII (Eyelash Palm Pit-viper, Bocaracá). **ATTEMPTED PREDATION**. *Herpetotheres cachinnans* (Laughing Falcon) is a common resident of lowland forest on both the Caribbean and Pacific slopes (up to 1850 m elevation) of Costa Rica (Stiles and Skutch 1989. A Guide to the Birds of Costa Rica. Cornell University Press, Ithaca, New York. 511 pp.). *Herpetotheres cachinnans* is known for its almost exclusive diet of snakes, including a "coral snake or a mimic thereof," vine snakes (*Oxybelis*), micas (*Spilotes pullatus*), and a "slender, green, arboreal snake" (Skutch 1983. *In* Janzen [ed.], Costa Rican Natural History, pp. 593–594. University of Chicago Press, Chicago, Illinois; Skutch 1999. Trogons, Laughing Falcons, and Other Neotropical Birds. Texas A&M University Press, College Station, Texas. 222 pp.). To my knowledge there have been no reports of pitvipers in the diet of laughing falcons. At 1515 h on 18 February 1999, I observed a *H. cachinnans* with a *Bothriechis schlegelii* at Parque Nacional Carara (09°46'27.0"N, 84°36'20.0"W). The adult *H. cachinnans* dropped the adult male *B. schlegelii* from a branch ca. 3 m above the ground. The snake's spine was severed and it lay motionless. The *H. cachinnans* remained perched over the snake with out moving until dusk (ca. 1730 h), when it flew off without the snake.

The *B. schlegelii* was deposited in the Texas Cooperative Wildlife Collections at Texas A&M University (TCWC 83394). I thank John H. Malone and Lee Fitzgerald for reviewing a draft of the manuscript. The inventory was conducted under MINAE RESOLUCION N°. 237-98-OFAU.

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BOTHROPS ERYTHROMELAS (Caatinga Lancehead). **REPRODUCTION**. *Bothrops erythromelas* inhabits xeric and semi-arid regions in northeastern Brazil under clusters of bromeliad, *Bromelia laciniosa* (Amaral 1923. Proc. New England Zool. Club 8:96–97) and riparian forests (Vanzolini et al. 1980. Répteis das Caatingas. Acad. Bras. Ciênc. Rio de Janeiro. 161 pp.). Lira-da-Silva et al. (1994. Revista Brasileira de Zoologia 11:187–193) collected a gravid female in the wild from Paulo Afonso, Bahia, Brazil. On 11 Jan 1993 (after ca. 123 days of gestation), this snake gave birth in captivity to 11 neonates (mean SVL = 192 mm ± 2.5 SD, range = 168–192). Machado and Cotta (1998. XXII Congresso Brasileiro de Zoologia, Abstract 1118.) reported that eight male and eight female *B. erythromelas* mated in captivity April–May 1991, with six females giving birth (mean = 11.4 neonates) in December and January after ca. 240 days of gestation. Here we report data on two litters of *B. erythromelas* born in captivity on 20 November 1998 and 11 November 2002, both from females collected in the wild. The first female was collected in March 1998 from Maracás, Bahia, Brazil (13°44'S, 40°43'W; 964 m) and gave birth after ca. 257 days of gestation to six live female neonates (IB 60518–60523; mean SVL = 184 mm ± 48 SD, range = 179–190; mean mass = 4.17 g ± 1.17 SD, range = 3.0–6.0 g). The second gravid female (590 mm SVL, 174 g) was collected in October 2002 from Brumado, Bahia, Brazil (14°20'S; 41°66'W, 422 m elev.) and gave birth after 32 days in captivity to two male and four female live offspring (mean SVL = 196 mm ± 5 SD, range = 190–205).

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Water cobras are routinely exposed to aerial predators when surfacing to breath. It is possible that the apparent pre-ecdysis

CHARINA BOTTAE (Rubber Boa). **DIET**. *Charina bottae* feed primarily on mammals, although lizards, birds, and squamate eggs are sometimes taken (Rodríguez-Robles et al. 1999. J. Zool., Lond. 248:49–58). Rubber Boas have been reported to raid rodent nests and consume multiple individuals during a single feeding event (Rodríguez-Robles et al. 1999. J. Zool. 248:49–58). Their blunt tails often show evidence of injury (Hoyer 1974. Herpetologica 30:275–283) and may serve to misdirect attacks by predators (Greene 1973. J. Herpetol. 7:143–161) or protective mother rodents (Hoyer and Stewart 2000. J. Herpetol. 34:354–360).

On 10 July 2004 we collected an adult male *C. bottae* (457 mm SVK, 64 mm TL, 61.4 g) from inside a fallen Lodgepole Pine (*Pinus contorta*) at the edge of an open meadow in mixed coniferous forest at Sagehen Creek Field Station, Nevada County, California (39.43228°N, 120.24150°W, 2014 m elev.). The boa voluntarily regurgitated two adult Montane Voles (*Microtus montanus*) shortly after capture. The combined mass of the prey was 38.4 g, a relative prey mass (prey mass/predator mass) of 0.63. To the best of our knowledge, this is the first verified report of *C. bottae* predation on *M. montanus*, although Fitch (1936. Am. Midl. Nat. 41:513–579) mentions a possible record. The voles and boa are deposited in the Museum of Vertebrate Zoology (MVZ 245392).

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