

# Other Contributions

## NATURE NOTES

### Amphibia: Caudata

***Ambystoma ordinarium*. Predation by a Black-necked Gartersnake (*Thamnophis cyrtopsis*).** The Michoacán Stream Salamander (*Ambystoma ordinarium*) is a facultatively paedomorphic ambystomatid species. Paedomorphic adults and larvae are found in montane streams, while metamorphic adults are terrestrial, remaining near natal streams (Ruiz-Martínez et al., 2014). Streams inhabited by this species are immersed in pine, pine-oak, and fir forests in the central part of the Trans-Mexican Volcanic Belt (Luna-Vega et al., 2007). All known localities where *A. ordinarium* has been recorded are situated between the vicinity of Lake Patzcuaro in the north-central portion of the state of Michoacan and Tianguistenco in the western part of the state of México (Ruiz-Martínez et al., 2014). This species is considered Endangered by the IUCN (IUCN, 2015), is protected by the government of Mexico, under the category Pr (special protection) (AmphibiaWeb; accessed 1 April 2016), and Wilson et al. (2013) scored it at the upper end of the medium vulnerability level.

Data available on the life history and biology of *A. ordinarium* is restricted to the species description (Taylor, 1940), distribution (Shaffer, 1984; Anderson and Worthington, 1971), diet composition (Alvarado-Díaz et al., 2002), phylogeny (Weisrock et al., 2006) and the effect of habitat quality on diet diversity (Ruiz-Martínez et al., 2014). We did not find predation records on this species in the literature, and in this note we present information on a predation attack on an adult neotenic *A. ordinarium* by a *Thamnophis cyrtopsis*.

On 13 July 2010 at 1300 h, while conducting an ecological study of *A. ordinarium* in a mountain stream located in the municipality of Morelia, Michoacán (in the central part of the Tran-Mexican Volcanic Belt), one of us (PGG) encountered an adult paedomorphic individual of *A. ordinarium* (estimated snout–vent length [SVL] = 90 mm; Anderson and Worthington [1971] considered a minimum SVL of 60 mm for adults of this species) being consumed by an adult (estimated SVL = 45 mm) *T. cyrtopsis* (Fig. 1). The predation attempt took place on top of a streamside log (19°40'20.12"N, 101°08'43.81"W; UTM); elev. 2,006 m. After ca. 3 min of observation, the snake disappeared into nearby vegetation while holding the salamander in its mouth, where we presume it finished ingesting the salamander. The air temperature was 19°C. The stream banks at this location contained riparian vegetation dominated by *Agnus acuminata*, *Fraxinus uhdei*, *Ilex toluicana*, and *Salix bonpladiana*, and the vegetation on the adjacent slopes consisted of pine-oak forest.



**Fig. 1.** A *Thamnophis cyrtopsis* holding an *Ambystoma ordinarium* in its mouth.

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We determined the identification of *A. ordinarium* because this species is the only aquatic salamander in mountain streams in the central part of the Trans-Mexican Volcanic Belt, as well as from its olive-brown ground color and yellow specks on the anterior portion of the venter (Anderson, 1975). We identified the predator species as *T. cyrtopsis* because it is the most common snake in the riparian habitat of mountain streams in the region where the predation event was recorded, as well as by its color pattern (Milstead, 1953).

*Thamnophis cyrtopsis* has a broad distribution that extends from southeastern Utah and southwestern Colorado, United States, southward through much of Mexico to central Guatemala, at elevations from near sea level to 2,700 m (Rossman et al., 1996). It occurs in a wide range of habitats, from desert flats, grasslands, tropical lowlands to pine-oak forest in mountains, and in some areas often is encountered in the vicinity of permanent and intermittent streams usually located in canyons (Rossman, et al., 1996). In Mexico, habitats where this species has been recorded include tropical barrancas, thorny scrub forest, tropical deciduous forest, and upper arid or mixed tropical cloud forest (Ramírez-Bautista and Hernández-Ibarra, 2004). This species mainly is a diurnal predator, and frequently is seen foraging for frogs and tadpoles. Food items may also include small fishes, skinks, crustaceans, earthworms (Rossman et al., 1996) and salamanders (Fouquette, 1954). The diurnal activity of *A. ordinarium* (Alvarado-Díaz et al., 2002) might facilitate its detection by a diurnal predator like *T. cyrtopsis*. In ecological terms, the predation of snakes on salamanders could act to regulate their populations (Wells, 2007). Considering the status of threatened species and the lack of information on the biology and natural history of *A. ordinarium*, it will be important to elucidate the impact of predation by *T. cyrtopsis* on this salamander.

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## Amphibia: Anura

***Diaglena spatulata* and *Smilisca baudinii*. Heterospecific amplexus.** The distribution of the Shovel-headed Treefrog (*Diaglena spatulata*) is restricted to the Pacific lowlands of western Mexico, from Sinaloa to Oaxaca, whereas that of the Mesoamerican Treefrog (*Smilisca baudinii*) extends from extreme southern Texas, United States, to extreme southern Costa Rica (Savage, 2002; Frost, 2015). Both species are explosive breeders that congregate in temporary ponds or pools of water after heavy rains, often in large numbers (Hardy and McDiarmid, 1969; Duellman, 2001; Savage, 2002).

On 23 June 2013, at Alta Vista, Sierra de Vallejo, Santiago de Compostela, Nayarit, Mexico (21.027751°, -105.122715°; WGS 84; elev. 270 m) we observed heterospecific amplexus among a trio of hylid frogs. Apparently a female *S. baudinii* was amplexed by a male *D. spatulata*, which in turn was amplexed by a male *S. baudinii* (Figs. 1, 2). The event was observed at ca. 1132 h at the start of the rainy season, in a temporary pond that formed the previous evening. We also observed several other species of bufonids and hylids at the same locality. Interspecific amplexus generally occurs between amphibians that overlap spatially and temporally (Höbel 2005a, b; Waterstrat et al., 2008), and usually involves individuals of the same genus or family (Streicher et al., 2010).



**Fig 1.** Heterospecific amplexus among a female *Smilisca baudinii* (bottom), a male *Diaglena spatulata* (middle), and a male *S. baudinii* (top) observed at Alta Vista, Sierra de Vallejo, Santiago de Compostela, Nayarit, Mexico.

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**Fig 2.** The amplexing trio of hylids (see Fig. 1 legend) eventually tumbled and began to separate.

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## Notes on the reproduction of the endemic Costa Rican toad, *Incilius chompipe* (Anura: Bufonidae)

Vaughan and Mendelson (2007) conducted a taxonomic and ecological review of populations of toads in Costa Rica and Panama referred to as *Crepidophryne epiotica*, and described two new species, *C. chompipe* and *C. guanacaste*, and redescribed *C. epiotica* (*sensu stricto*). In a subsequent phylogenetic study, Mendleson et al. (2011) found *Crepidophryne* nested within *Incilius*, and thus synonymized the former genus with the latter.

Vaughan and Mendelson (2007) noted that the reproductive biology of the toads formerly in *Crepidophryne* had not been documented in the wild, but suggested that these toads deposit their eggs in leaf litter and that the eggs undergo direct development. Additionally, for *I. chompipe* they stated (p. 310) that the “mode of amplexus was unknown and no tadpole had ever been found.”

In July of 2013 we collected individuals of *I. chompipe* along the eastern slopes of Volcán Turrialba, Provincia de Cartago, Costa Rica, at an elevation of 2,200 m. We discovered the toads approximately 2 m from the ground, on roadside rock-faces beneath sheets of wet moss. Later, we exported three individuals (2 males, 1 female) to The Manchester Museum, to be maintained in captivity.

After an acclimatization period of several months, on 10 May 2014 we observed the toads in axillary amplexus, similar to the description provided by Boza and Solano (2009) for *I. epioticus*. On 15 May 2014 we discovered approximately 60 large unpigmented eggs laid under a sheet of damp moss, but we did not observe the actual deposition. The egg yolks were yellow-white in color and enclosed within separate clear gelatinous capsules, and we noticed the first signs of development within the first five to seven days. During their development, the eggs ranged in size from 4.2 to 5 mm in diameter. The female provided the eggs with parental attendance throughout the development period (Fig. 1). During times when we examined the clutch, the female often would adopt a motionless flattened stance, spreading her body as wide as possible across the highly visible clutch. This behavior appeared different from that of thanatosis, an anti-predator defense mechanism employed by this species (Sánchez Paniagua and Abarca, 2016). During thanatosis individuals of *I. chompipe* were described to lay motionless, feign death, and inflate their bodies (Sánchez Paniagua and Abarca, 2016). We observed this behavior when the female was handled, but our observations when she was attending the clutch, spreading and visibly flattening her body, clearly was a separate response. We contend that this flattened posture over the highly visible white-colored eggs was adopted in an effort to hide them by using her camouflaged dorsum, and thus her attendance to the clutch was in a guarding capacity. The development of the young within the eggs lasted 50 to 52 days.

Prior to hatching the coloration of the developing young was consistent, with white edged dark brown markings upon a pale brown dorsal coloration. These markings were visible through the egg capsule (Fig. 2). The first toadlet hatched on 4 July 2014. Upon hatching, the tail was highly reduced and almost fully absorbed. The young were able to walk almost immediately upon hatching, and measured approximately 4.2–4.6 mm in snout–vent length. The markings of the hatchlings were similar to those of a juvenile *Crepidophryne epiotica* (= *I. epioticus*) illustrated in Köhler (2011).

Direct development as a characteristic reproductive mode has evolved independently in the three living amphibian orders: frogs, salamanders, and caecilians (Hanken, et. al., 1997). In New World anurans, direct development within the egg previously was known in frogs in the families Brachycephalidae, Craugastoridae, Eleutherodactylidae, and Strabomantidae, of which the last three families occur in Mesoamerica (Hedges et al., 2008); it also is known in the genus *Oreophrynella*, high elevation bufonids found in South America (McDiarmid and Gorzula, 1989). Although considered characteristic of other Neotropical bufonid genera, direct development has not been confirmed in other species.

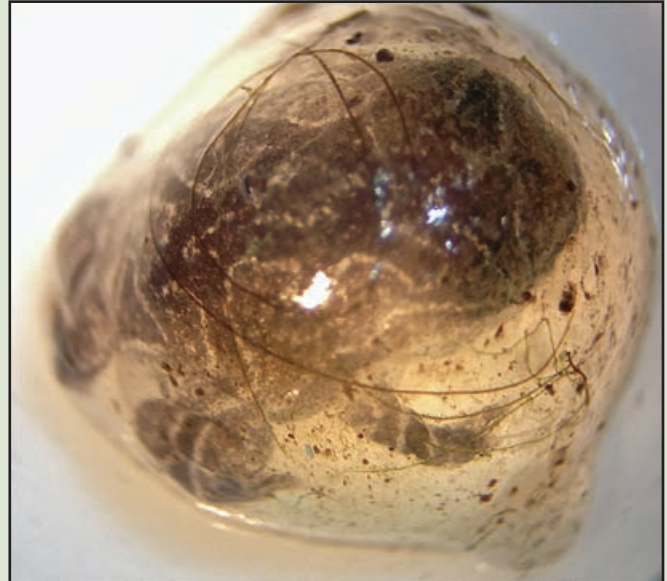
*Osornophryne guacamayo* is a South American bufonid thought to have developed direct development as a mode of reproduction. It occurs at elevations from 1,800 to 2,200 m (similar to the elevational range of *I. chompipe*) on the eastern slopes of the Andes and adjacent foothills in central Ecuador (Gluesenkamp and Acosta, 2001). The clutch size and egg description for *O. guacamayo* also appears similar to that of *I. chompipe*, and the eggs are deposited in sites without any available aquatic reproduction opportunities. In comparison to our findings, a clutch of 50 eggs deposited by *O. guacamayo* and found under a roadside rock in 1990 by L. Coloma and J. Wiens had similarly colored egg yolks within gelatinous capsules, and the eggs ranged in size from 3 to 6 mm. Further, the breeding of *O. guacamayo* in captivity in August of 1992 by L. Coloma produced a clutch of eggs deposited terrestrially in moss, but unfortunately they suffered a fungal infection and their development could not be followed or described (Gluesenkamp and Acosta, 2001). Although the developmental mode in *Osornophryne* has not been confirmed, based on several factors linking it closely to that of the direct developing species *Oreophrynella quelchii*, it has been suggested that its eggs also undergo direct development (Gluesenkamp and Acosta, 2001). Both direct development and parental attendance is confirmed as characteristic in the high elevation South American bufonid genus *Oreophrynella*, an unusual group of toads known only from the Tepuis that make up the Roraima mountain group in the Guayanian Highlands of southern Venezuela and adjacent Guyana and Brazil; their eggs also are large in size (3 mm) unpigmented, and full development is completed within the egg whilst attended by an adult throughout different stages of development (McDiarmid and Gorzula, 1989).

This note represents the first report of direct development in any Mesoamerican bufonid, and therefore has wide herpetological significance. From a natural history evolutionary perspective, the fact that *I. chompipe* has direct development as a reproductive mode represents a remarkable conversion in the breeding biology of Mesoamerican bufonids. This confirmation supports the contentions of Mendelson et al. (2011), and as highlighted by them, it parallels the breeding biology of South American bufonids of the genus *Oreophrynella*, and possibly

*Osornophryne*. We hope these observations highlight some of the benefits to maintaining specimens in captivity to facilitate behavioral observations that would otherwise be impossible to follow in the field. We also hope these observations help shed new light on the biology of Costa Rican amphibians and they prove useful in the advancement of understanding Mesoamerican bufonid phylogeny by others.



**Fig. 1.** A captive female *Incilius chompipe* attending newly laid terrestrial egg clutch. © Andrew R. Gray



**Fig. 2.** A fully formed juvenile of *Incilius chompipe* within the egg capsule prior to hatching. © Andrew R. Gray

**Acknowledgments.**—We expressly thank Javier Guevara Sequeira of the Ministerio del Ambiente y Energía/ Sistema Nacional de Áreas de Conservación, Costa Rica, for his support. We also sincerely thank Brian Kubicki for identifying and sharing the site location, which represents a range extension for the species, both George Madani and Alex Petchy for their help in specimen collection, and Louis W. Porras for his valuable comments on the manuscript. A research and export permit was provided by Ministerio del Ambiente y Energía (MINAE) (Resolución No: 069-2013-SINAC (DGVS-339-2013) y exportación autorizada No: 7317). Manchester Museum registered specimen numbers: *Incilius chompipe*: D.1288 (adult male); *Incilius chompipe*: D.1289 (adult female); *Incilius chompipe*: D.1290 (newly hatched juvenile).

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***Lithobates warszewitschii* (Schmidt, 1857). Cannibalistic behavior.** Most anurans are not considered selective predators, because their diet varies depending on food availability (Rodríguez et al., 1997). Medium- and large-sized anurans probably are opportunistic predators of smaller amphibians (Wells, 2010). On 23 June 2014 we observed an adult *Lithobates warszewitschii* feeding on an adult conspecific (Fig. 1) in Reserva Biológica Alberto Manuel Brenes, Provincia de Alajuela, Alajuela Costa Rica (10°13'18.24"N, 84°35'48.99"W, WGS 84).



**Fig. 1.** A *Lithobates warszewitschii* feeding on an adult conspecific in Reserva Biológica Alberto Manuel Brenes, Provincia de Alajuela, Costa Rica. © Rodrigo Rojas

This species is distributed from northeastern Honduras to central Panama, on the Atlantic versant, and on the Pacific versant from northwestern Costa Rica to eastern Panama, at elevations from near sea level to 1,740 m (Savage, 2002). To the best of our knowledge, this is the first photographic record of cannibalism in this species, at least during the adult stage. Based on the literature on other members of the family Ranidae, this behavior was

expected, as several species have been reported to feed on tadpoles, juveniles, and adults of other ranids, or of the same species (e.g. *L. blairi*, *L. catesbeianus*, *L. clamitans*, *L. sylvaticus*, *L. vaillanti*, *Rana cascadae*, *R. luteiventris*, *R. muscosa*, *R. pretiosa*, *Pelophylax lessonae*, *P. perezii*, and *P. ridibundus*) (Wells, 2010).

In general, interactions among anurans species (including cannibalism) primarily have been studied during the larval and not the terrestrial stage (Werner et al., 1995). Thus, it is relevant to present information regarding cannibalistic behavior for a less-studied species, in comparison with the information available for other members of the genus (e.g. *L. catesbeianus*) (AmphibiaWeb, 2016).

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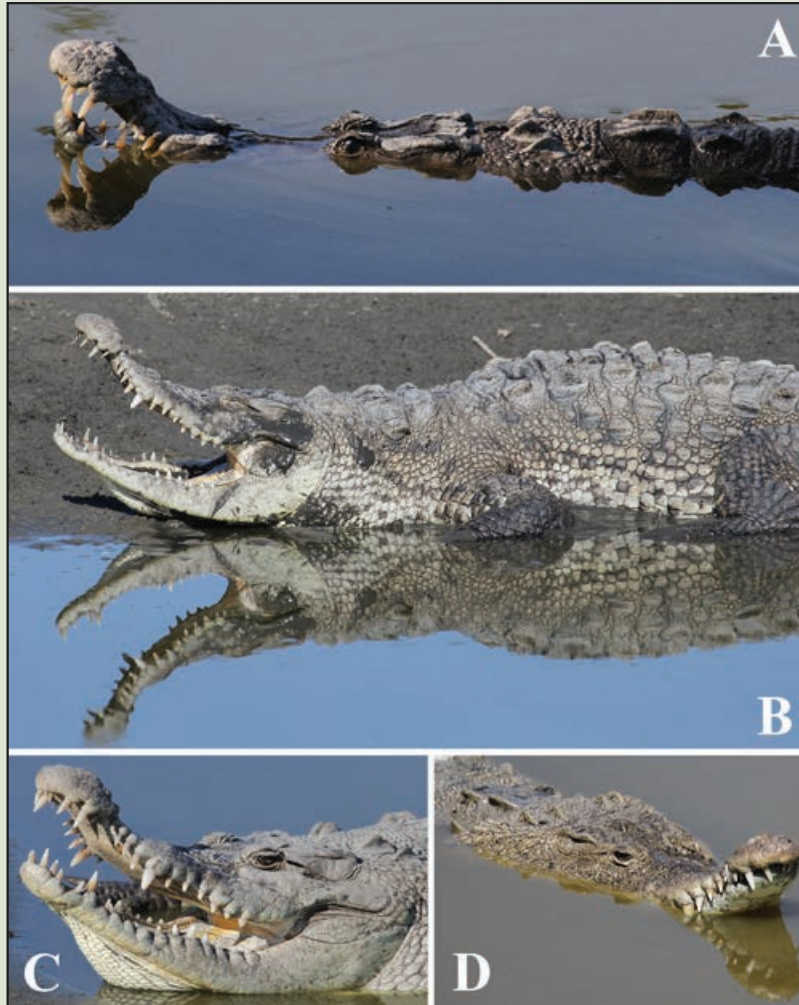
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## Reptilia: Crocodylia

***Crocodylus acutus* (Cuvier, 1807). Rostral abnormality.** Certain rostral abnormalities in crocodylians have been reported, such as prognathia (elongated lower jaw), brachygnathia (shortened lower jaw), agnathia (completely missing lower jaw), crossbite (lower or upper jaw laterally displaced) and an upward curving of the snout (Hutchzermeyer, 2003). On 7 March and 1, 2 and 7 May 2013, at Marina Vallarta Golf Course (20°39'59"N, 105°15'48"W; datum WGS 84; elev. 5 m) in Puerto Vallarta, Jalisco, Mexico, we observed and photographed an adult American Crocodile, *Crocodylus acutus* (total length  $\leq$  2.50 m; individual not captured and sexed), with a rostral abnormality. The upper and lower jaws of the individual were curved upward, from the base to the tip of the snout (Fig. 1). Jaw abnormalities in crocodylians are considered ontogenetic rather than the result of post-hatching injuries (Webb and Manolis, 1983). To our knowledge, this is the first report of this type of rostral abnormality in the relatively longirostrine *C. acutus*, a widely distributed species in coastal regions of the northern Neotropics (Thorbjarnarson, 1989).





**Fig. 1.** An American Crocodile, *Crocodylus acutus*, in Puerto Vallarta, Jalisco, Mexico. (A) In water (7 March 2013); (B) basking (1 May 2013); (C) head zoom on land (2 May 2013); and (D) head zoom in water (7 March 2013). 📷 © Frank Mc Cann

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***Crocodylus moreletii*. Cannibalism.** Morelet's Crocodile (*Crocodylus moreletii*) occurs throughout much of the Atlantic lowlands of Mexico, Guatemala, and Belize (Groombridge, 1987; Lee 2000). On 15 July 2015, during a crocodile survey conducted in Laguna Chichankanab, Quintana Roo, Mexico (19°53'38.3"N, 88°46'00.4"W; datum WGS 84, elev. 90 m) as part of ongoing population monitoring and an ecotoxicology study, we captured and stomach-flushed (Taylor et al., 1978; Fig. 1) an adult male *C. moreletii* (total length [TL] = 1.93 m, body mass = 24 kg). Among the ingesta recovered from the stomach, we found a metal tag (MX1925 / AC-CITES @ CONABIO.COM.MX) (Fig. 2). Previously, we had clipped this tag onto the foot webbing of a subadult female *C. moreletii* (TL = 146 cm, body mass = 7.8 kg) captured on 26 August 2014, ca. 5 km to the south within this lake (19°51'2.6"N, 88°45'36"W; datum WGS 84). This finding suggests that the adult male preyed upon the subadult female, unless it had died for an unknown reason and the adult male later scavenged the carcass.



**Fig. 1.** Heimlich maneuvers for flushing the stomach contents of an adult male *Crocodylus moreletii* captured on 15 July 2015 at Laguna Chichankanab, Quintana Roo, Mexico. © Mauricio González-Jáuregui

Cannibalism is a particular type of predation or scavenging that appears common among crocodylians, and might function to regulate population densities (e.g., *Alligator mississippiensis*: Rootes and Chabreck, 1993; Delany et al., 2011); however, the importance of cannibalism as a regulatory mechanism remains unclear (Grigg and Kirshner, 2015). Larger individuals are major predators of smaller ones, both within and between species (Hippel, 1946; Cott, 1961; Graham, 1968; Webb and Manolis, 1998), as an expression of intraspecific competition and probably intraguild predation (Polis et al., 1989). Cannibalism has been documented both in captivity (e.g., in *C. palustris*: Reddy, 1978; *C. niloticus*: Hutton, 1984; *C. porosus*: Owen et al., 2014) and in the wild (e.g., in *Caiman crocodilus*: Staton and Dixon, 1975; in *A. mississippiensis*: Platt et al., 2014; in *C. acutus*: Richards and Wasilewski, 2003). According to several documented cases, large adults prey on large juvenile, subadult, or small adult conspecifics: Pooley (1969) reported an adult *C. niloticus* (TL = 2 m) catching and eating a young (TL = 1 m) conspecific, Rootes and Chabreck (1993) found that large adult *A. mississippiensis* (TL = 2.73 m) preyed heavily on large juveniles and small adults (TL = 1.22–2.12 m), and Platt et al. (2014) reported three cases where adult *A. mississippiensis* (estimated TL = 2.1–3.3 m) preyed on intermediate sized conspecifics (estimated TL = 1.3–2.1 m). Aggressive behavior (but not cannibalism) by adults of *C. moreletii* toward conspecific juveniles has been observed

in captivity (Hunt, 1977), but Pérez-Higareda et al. (1989) documented the first case of cannibalism and necrophagy in the wild at Laguna de Nixtamalapan, Veracruz, Mexico, when a medium-sized individual (TL = 1.55 m) killed and eventually scavenged (2–3 days later) a smaller conspecific (estimated TL = 1 m). Our observation complements the earlier report of Pérez-Higareda et al. (1989) and represents the second documented case of cannibalism in *C. moreletii*. We speculate that cannibalism at our study site probably was triggered by intraspecific competition, judging by the high crocodile densities we have recorded (J. Cedeño-Vázquez, unpublished).



**Fig. 2.** Metal tag collected from stomach contents of the *Crocodylus moreletii* shown in Fig. 1.

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***Crocodylus moreletii*. Diet.** Morelet's Crocodile, *Crocodylus moreletii*, occurs at low elevations on Gulf and Caribbean slopes from Tamaulipas and San Luis Potosí, Mexico, south and eastward through northern Guatemala, Belize, and the Yucatan Peninsula (Lee, 1996). On 18 August 2011, during a crocodile survey conducted in Laguna Chichankanab, Quintana Roo, Mexico (19°52'5.2"N, 88°45'52.9"W; datum WGS 84; elev. 5 m), as part of ongoing population monitoring and a parasitology study, we captured and stomach-flushed (Taylor et al., 1978) an adult female *C. moreletii* (total length = 72 cm, body mass = 14.14 kg). Among the ingesta recovered from the stomach, we found two anurans: the complete body of an adult Mahogany Treefrog (*Tlalocohyla loquax*), and the partially digested body of a juvenile Gulf Coast Toad (*Incilius valliceps*) (Fig. 1). To our knowledge this is the first predation record by *C. moreletii* on *T. loquax* and *I. valliceps*.

Anurans rarely are found in dietary studies of crocodylians (Hippel, 1946; Webb et al., 1982; Delany, 1990; Platt et al. 1990; Webb et al., 1991; Thorbjarnarson, 1993; Tucker et al., 1996), including *C. moreletii* (Platt et al., 2006). For several reasons, however, the consumption of anurans by crocodylians should be interpreted with caution. The rapid digestion of amphibians in the crocodylian stomach suggests they are underrepresented in dietary studies based on stomach contents (Platt et al., 2006). For instance, Delany and Abercrombie (1986) noted that Greater Sirens (*Siren lacertina*) fed to captive *Alligator mississippiensis* were digested totally within 24 hours. The state of the two anurans we recovered (Fig. 1), suggests consumption occurred only a few hours earlier when these anurans became active, judging by the time the crocodile was captured (2153 h). In addition, although bufonid anurans such as the Marine Toad (*Rhinella marina*, formerly *Bufo marinus*) might be avoided as a food source by crocodylians due to the toxic properties of bufogenin, *C. moreletii* might regularly consume *R. marina* without detrimental effects (Platt and Rainwater, 2007). This contrasts markedly with observations of mortality following consumption of *R. marina* by *C. johnstoni* and *C. porosus* in Australia (Letnic and Ward, 2005; Smith and Phillips, 2006).



**Fig. 1.** An adult *Tlalocohyla loquax* and a juvenile (partially digested) *Incilius valliceps* recovered from the stomach of an adult female *Crocodylus moreletii* captured on 18 August 2011 in Laguna Chichankanab, Quintana Roo, Mexico.

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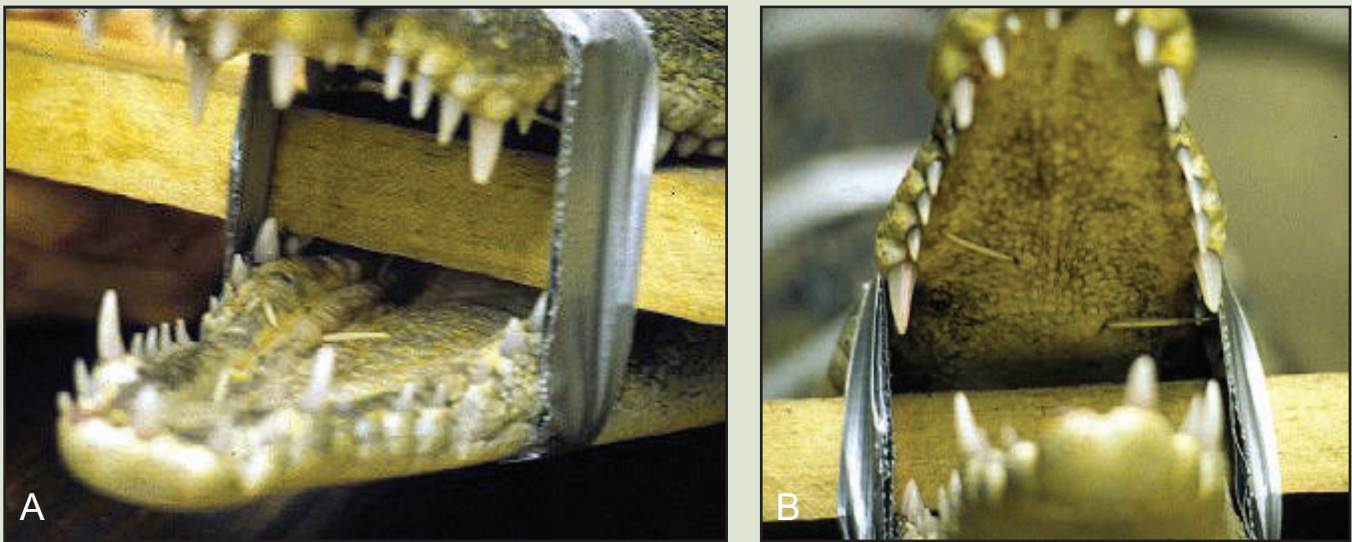
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## **Predatory interaction between a Morelet's Crocodile (*Crocodylus moreletii*) and a Mexican Hairy Porcupine (*Sphiggurus mexicanus*) in Belize**

New World porcupines (Erethizontidae) in the genera *Chaetomys*, *Coendou*, *Echinoprocta*, *Erethizon*, and *Sphiggurus* occur from the Arctic Circle southward to Uruguay, in South America (Feldhamer et al., 2003; Voss, 2011). The dorsum and tail of these erethizontids are cloaked in barbed, keratinized quills that make these animals formidable and potentially lethal prey (Vincent and Owers, 1986). Nonetheless, predation of porcupines by snakes (Cherubini et al., 2003; Duarte, 2003; Campbell and Lamar, 2004 and references therein), turtles (Smith and Casper, 2015), birds (Katzner et al., 2015), and mammals (Quick, 1953; Cook and Hamilton, 1957; Thompson et al., 2009) has been documented, although occasionally at a high cost to the predator (e.g., de Vos, 1953; Cherubini et al., 2003; Katzner et al., 2015). Here we describe an apparent predatory interaction between a Morelet's Crocodile (*Crocodylus moreletii*) and a Mexican Hairy Porcupine (*Sphiggurus* [formerly *Coendou*] *mexicanus*) in Belize. *Sphiggurus mexicanus* is a poorly studied species (Monterrubio-Rico et al., 2010) that ranges from southern Mexico to Panama and Costa Rica (Emmons and Feer, 1997), and appears to be common in forested areas of Belize (SGP, TRR, STM, pers. observ.).

On 15 May 1999 at 2128 h, we captured a small adult male *C. moreletii* (total length [TL] = 175.5 cm; snout-vent length [SVL] = 85.0 cm) in New River Lagoon, Orange Walk District, Belize, as part of studies on ecotoxicology (Rainwater et al., 2002, 2007, 2008) and diet (Platt et al., 2006). New River Lagoon (17°42'N; 88°38'W; datum WGS 84) is an extensive freshwater wetland system (ca. 1–2 km wide × 18 km long) drained by the New River into Corozal Bay (study area described in greater detail by Rainwater et al., 1998). Upon capture, we noted 10–15

porcupine quills embedded in the snout and mandible of the *C. moreletii*, which we immediately extracted to prevent injury to ourselves while handling the animal. We then transported the crocodile to our field station for further processing and data collection. The following morning (ca. 12 h later) we measured the crocodile and removed the jaw restraints in order to recover the stomach contents (methods described in Platt et al., 2006). While opening the mouth to insert a flexible plastic tube down the esophagus, we found 10 additional porcupine quills—four were embedded in the maxilla and six in the tongue and mandible (Fig. 1). We removed these quills before continuing with the stomach flushing procedure. Items recovered from the stomach included the flesh and operculum of an Apple Snail (*Pomacea flagellata*), and a mass of unidentifiable partially digested material. Notably, we found no porcupine quills among the stomach contents. We permanently marked the *C. moreletii* by notching the dorsal edge of a unique series of caudal scutes (Jennings et al., 1991), and released it at the capture site in the late afternoon (ca. 15 h after capture). On 5 July 2000, we recaptured the *C. moreletii* and noted that the TL and SVL had increased during the recapture interval, to 184.4 cm and 91.5 cm, respectively (growth rate = 5.75 cm/year based on SVL). This time the stomach contents included shell fragments, opercula, and flesh from Apple Snails.



**Fig. 1.** Quills of Mexican Hairy Porcupine (*Sphiggurus mexicanus*) embedded in the maxilla (A) and tongue/mandible (B) of a Morelet's Crocodile (*Crocodylus moreletii*) in Belize. © Thomas R. Rainwater

To our knowledge, this is the first report of crocodylian predation (or attempted predation) of a New World porcupine. Because we found no porcupine remains among the stomach contents, we cannot state with certainty that our observation represents a successful predation attempt by *C. moreletii*. While flesh and bone are digested rapidly (24–48 h) in the low pH of the stomach (Delany and Abercrombie, 1986; Janes and Gutzke, 2002), porcupine quills could remain embedded in the outer integument of the crocodile for an indefinite and perhaps lengthy period. Therefore, the quills we noted might attest to a predation event that occurred days or even weeks before we captured the crocodile, and any soft body parts in the stomach would have been digested during the interim. Moreover, although keratinized structures such as hair and feathers are known to persist for longer periods in the crocodylian stomach (Delany and Abercrombie, 1986; Janes and Gutzke, 2002), studies of mammalian predators indicate quills often become embedded in the lining of the stomach and intestine (Quick, 1953). Also, the size and elongate shape of the quills may have lessened the chances of successfully passing through the stomach flushing tube. Thus, even if present in the crocodile stomach, quills might prove difficult to recover through stomach flushing.

Furthermore, we cannot rule out the possibility that the quills resulted from the crocodile scavenging a porcupine carcass rather than predation. Scavenging can be difficult to distinguish from predation except by direct observation (DeVault et al., 2003) or under special circumstances (e.g., Platt et al., 2010; Platt and Rainwater, 2011), and

remains a poorly documented trophic pathway for *C. moreletii* (and crocodylians in general). The only reported instances of scavenging by *C. moreletii* involve the consumption of large mammals (Pérez-Higareda et al., 1989; Platt et al., 2007), although we see no reason why the carcasses of smaller mammals would not be consumed if available.

The quills of New World porcupines are barbed, causing them to migrate into the body after becoming embedded, and the consequences can include death (Vincent and Owers, 1986; Cherubini et al., 2003; Katzner et al., 2015). Indeed, Katzner et al. (2015) found that 39% of the interactions between porcupines and birds resulted in the death of the latter. Our subsequent recapture of the *C. moreletii* 14 months later, and with the individual apparently in good health and with the evidence of normal growth, suggests there were no lasting effects from its encounter with the porcupine. This outcome, however, could be attributed to our removal of the quills shortly after capture. In lieu of our intervention, the quilling sustained by the crocodile ultimately might have proved lethal.

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## Reptilia: Testudines

***Dermatemys mawii* Gray, 1847. Longevity.** Many aspects of the life history of the Central American River Turtle, *Dermatemys mawii*, remain poorly studied or unresolved. Field studies have shed light on various aspects of its ecology (Vogt, 1988; Vogt and Flores-Villela, 1992), including population dynamics (Polisar, 1995, 1997), diet (Moll, 1989), and reproduction (Polisar, 1992, 1996); however, long-term studies that potentially could assess life expectancy and longevity are lacking. In light of the absence of field data, individuals of *D. mawii* maintained for long periods in captivity can provide some insight on the lifespan of this species.

A total of 37 *D. mawii* have been maintained in accredited zoological institutions of the Association of Zoos and Aquariums (AZA) in the United States since 1960 (Smith, 2015); additional individuals also have been maintained in zoos and private collections in Europe, Mexico, Guatemala and Belize. Historically, most individuals for which lifespan data are available have not fared well in captivity, with only six animals from the AZA population surviving longer than 10 years and three living longer than 20 (Smith, 2015), likely due to a poor understanding of their biological requirements at the time.

As of May of 2016, an adult male *D. mawii* residing at the Jacksonville Zoo and Gardens (JZG) has lived in captivity for 35.7 years. The turtle originally was purchased as a wild-caught adult from a fisherman in Belize City, Belize, in August of 1980 (S. Seashole, pers. comm.), and the following month it was acquired by the Oklahoma City Zoo. Since then, it was maintained in several other zoological parks before arriving at JZG in 2015. Given its adult size at the time of collection, this individual likely is over 40 years in age. A wild-caught Guatemalan female was acquired by the Philadelphia Zoo in August of 1993, and still is alive today at JZG after 22.7 years in captivity; its age or size class at the time of acquisition is unknown. These individuals represent the oldest wild-caught male and female *D. mawii* recorded to date. The longest-living captive-hatched *D. mawii* with known hatch date is a 22.3

year-old female of Guatemalan decent that was hatched at the Philadelphia Zoo in January of 1994, and currently resides at JZG.

Vogt et al. (2011) noted that the carapace scutes in “older individuals” of *D. mawii* become fused and are shed together as a single piece. At JZG, only the male sheds its carapace scutes in a single piece (Fig. 1), whereas both females continue to shed their scutes individually. Although the true ages of the male and one of the females are unknown, this distinction might suggest substantial age differences between these individuals.

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**Fig. 1.** Fused carapace scutes shed by an adult male *Dermatemys mawii* believed to be over 40 years in age. © Robert W. Mendyk

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## Reptilia: Squamata (lizards)

***Anolis (Norops) tropidonotus* Peters 1863. Reproduction.** Ongoing debate exists regarding the generic arrangement of the Dactyloidae. A discussion of this issue is beyond the scope of this work, and herein we chose to maintain use of the generic name *Anolis*. *Anolis tropidonotus (sensu lato)* recently was split into four species (*A. mccraniei*, *A. spilorhipis*, *A. tropidonotus*, and *A. wilsoni*), which on the Atlantic versant collectively are distributed from central Veracruz, Mexico, to north central Nicaragua, and on the Pacific versant from extreme northern El Salvador to south-central Honduras (McCranie and Köhler, 2015; Köhler et al., 2016). These medium-sized anoles are found in a wide variety of forested habitats, at elevations from near sea level to 1,900 m (McCranie and Köhler, 2015). Considering the recent taxonomic modifications, the distribution of *A. tropidonotus* now is restricted to the Atlantic versant of Mexico (including the Yucatan Peninsula), Belize, and Guatemala (Köhler et al., 2016).

On 25 September 2015, at 1600 h, we collected an adult female *A. tropidonotus* (Fig. 1) at El Tepeyac, Municipio de Eloxochitlán, Puebla, Mexico (18.486417°N, 96.857611°W, WGS 84; elev. 100 m). The collecting site is less than 200 m from the Río Tepeyac, a major tributary of the Río Papaloapan, and a rocky stream flows nearby; the vegetation consists of lowland semi-evergreen forest, and the lizard was active on the ground on top of deep leaf litter. The specimen was deposited in the herpetological collection of the Museo de Zoología “Alfonso L. Herrera,” Facultad de Ciencias, Universidad Nacional Autónoma de México (MZFC 30038). The snout–vent length (SVL) of the specimen was recorded as 52.2 mm. Upon dissection, we found that the specimen contained one egg and numerous yolked ovarian follicles. The egg is ellipsoidal and the major and minor axes measure 10.4 and 6.5 mm, respectively. The diameter of the follicles ranged from 0.5 and 4.4 mm; most follicles were closer to the lowest value of the size range, with four individuals measuring closer to 4.4 mm in diameter. We spent approximately 2 h sampling in the area and did not capture another female, whereas we collected four males.



Fig. 1. A specimen (MZFC 30038) of *Anolis tropidonotus* in life.

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Despite its wide range and local abundance, relatively few studies have addressed the reproductive biology and natural history of *A. tropidonotus (sensu lato)*. In particular, little reproductive information is available for the Mexican populations. Based on a survey conducted in Honduras in late May of 1972, Jackson (1973) commented on the population biology of a mid-elevation population now assignable to *A. mccraniei*. He found that all the females with an SVL greater than 40 mm showed yolked ovarian follicles, and inferred that they had laid only one egg since the onset of the reproductive season. Additionally, he also captured more adult males than adult females (56 and 28, respectively), and attributed the disparity to collecting bias because females appeared to be more terrestrial and wary. In their monograph on the anoles of Honduras, McCranie and Köhler (2015) indicated that the

reproductive season of *A. tropidonotus* (*sensu lato*) begins at the end of the dry season and peaks during the rainy season. Additionally, Campbell (1998) noted that females of *A. tropidonotus* laid several single egg clutches during the course of a reproductive season, as previously has been recorded in other anoles (Andrews and Rand, 1974). This information is consistent with our observations as a single egg and multiple vitellogenic follicles were present in MZFC 30038.

**Acknowledgments.**—Fieldwork was conducted under a collecting permit issued to Uri O. García-Vázquez by the Secretaría de Medio Ambiente y Recursos Naturales (permit number FAUT-0243). We thank Adrián Nieto-Montes de Oca for providing the facilities for examining the specimens, Edmundo Pérez-Ramos for cataloguing material into the MZFC collection, and Louis W. Porras for his valuable comments on a draft of this manuscript.

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***Aspidoscelis deppii* (Weigmann, 1834).** **Diet.** *Aspidoscelis deppii* is a terrestrial, locally abundant, diurnal teiid that in Nicaragua is known to feed on insects, spiders, opilionids, pseudoscorpions, centipedes, crustaceans, mollusks, and plant seeds (Vitt et al., 1993), as well as younger conspecifics (Alemán and Sunyer, 2014).

On 11 December 2015 at 0950 h, at playa El Bancón (11.47677°N, 85.63116°W, datum WGS 84; elev. 35 m), Reserva Ecológica Charco Verde, Reserva de la Biósfera Isla de Ometepe, Departamento de Rivas, Nicaragua, JGMF and FAR observed an adult female *A. deppii* chasing a juvenile *Sceloporus variabilis* on a freshwater beach, ca. 8 m from the shoreline. The general area contained relatively well-preserved patches of Lowland Dry Forest (Holdridge, 1967; Savage, 2002). The *A. deppii* subdued the *S. variabilis* by biting it on the neck and shaking it violently until it died (Fig. 1), immediately swallowed its prey head first, and disappeared under dense vegetation. The entire process, from the beginning of the chase until the lizard finished swallowing its prey, lasted under 1 min.

Our observation took place ca. 11 km SW of the location where Alemán and Sunyer (2014) recorded an *A. deppii* preying on a conspecific juvenile. Interestingly, both observations were made on the same freshwater island and correspond to attacks conducted by presumably gravid adult females. Paradoxically, Köhler and Fried (2012) recorded an adult male *S. variabilis* preying on a juvenile *A. deppii* in a nearby mainland locality in southwestern Nicaragua.



**Fig. 1.** (A, B) Sequential images of an adult female *Aspidoscelis deppii* preying on a juvenile *Sceloporus variabilis* on Isla de Ometepe, Nicaragua. © José Gabriel Martínez-Fonseca

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***Aspidoscelis lineattissima* (Cope, 1878). Diet.** The Twelve-lined Whiptail, *Aspidoscelis lineattissima*, is a medium-sized lizard endemic to Mexico (maximum snout–vent length = 112 mm; García and Ceballos, 1994), which occurs along the Pacific lowlands from central Nayarit southward the Río Balsas and Valle de Tepalcatepec area in Michoacán and northern Guerrero, at elevations from sea level to 1,000 m (Duellman and Wellman, 1960; Ponce-Campos and García-Aguayo, 2007). This terrestrial species is a diurnal and terrestrial forager that has been reported to feed on insects, arachnids, myriapods, and gastropods (Balderas-Valdivia and Ramírez-Bautista, 2002; Campos-Reyes, 2008; Güizado-Rodríguez and Casas-Andreu, 2011), and a snake (*Conophis vittatus*) also was found in the stomach contents of a specimen (Güizado-Rodríguez et al., 2006). *Aspidoscelis lineattissima* is protected by Mexican law (SEMARNAT) under the Special Protection category (Ponce-Campos and García-Aguayo, 2007). Although cockroaches (Blattodea) are part of the diet of *A. lineattissima* (Güizado-Rodríguez and Casas-Andreu, 2011), to date they have not been identified to species level.

On 26 October 2007, at the campus of the Universidad de Guadalajara (20°42'14.33"N, 105°13'18.25"W; datum WGS 84; elev. 11 m) in Puerto Vallarta, Jalisco, Mexico, we observed an individual of *A. lineattissima* preying on a live Surinam Cockroach, *Pycnoscelus surinamensis* (Fig. 1). This introduced, parthenogenetic cockroach has become a peridomestic and greenhouse pest, and is a potential vector of nematodes (Schwabe, 1949). Although probably not a significant factor in the biological control of *P. surinamensis*, as blattodeans are not an important part of the diet of *A. lineattissima* (Güizado-Rodríguez and Casas-Andreu, 2011), this lizard might be perceived as “beneficial” to humans because it preys on a pest.



**Fig. 1.** An *Aspidoscelis lineattissima* preying on a non-native cockroach, *Pycnoscelus surinamensis*, in Puerto Vallarta, Jalisco, Mexico. © Frank Mc Cann

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***Aspidoscelis guttata* (Wiegmann, 1834). Opportunistic water acquisition.** Animals obtain water from three sources: preformed water (contained in food), metabolic water, and liquid water (when enough water molecules located in one place form a pool) (Pough et al., 2004). Water collection has been reported for a number of species of lizards and snakes (Nielsen et al., 2016; Mata-Silva et al., 2014, and citations therein).

Herein, we report an observation of water consumption by the Mexican Racerunner, *Aspidoscelis guttata*, in coastal Oaxaca, Mexico. This endemic teiid is distributed in the state of Veracruz, on the Atlantic versant, and in the states of Guerrero, Oaxaca, and Chiapas on the Pacific versant. Its elevational range extends from sea level to 1,200 m (Köhler, 2008). Despite its relatively wide distribution, little is known regarding its natural history and behavior (Mata-Silva and Ramírez-Bautista, 2005).

On 23 December 2013 at 1530 h, one of us (SMG) observed an adult *A. guttata* drinking water from a poultry waterer (Fig.1). This observation took place in the backyard of a house located in the town of La Luz, Municipio de Villa de Tututepec de Melchor Ocampo, Oaxaca, Mexico (16.113361°N, 97.596647°W; WGS 84; elev. 55 m). The lizard drank water for ca. 1 min, but because of the shape of the waterer and point of observation SMG could not discern if the lizard drank the water by licking or swallowing movements. In this region, animals likely find



**Fig. 1.** An adult Mexican Racerunner (*Aspidoscelis guttata*) drinking water from a poultry waterer in La Luz, Municipio de Villa de Tututepec de Melchor Ocampo, Oaxaca, Mexico. 📷 © Stephanye Mata-González

it difficult to locate standing water during the dry season (November–May), making it advantageous for lizards to obtain water from artificial sources when easily accessed. To the best of our knowledge, this report represents the first observation of water drinking behavior in *A. guttata*.

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**Mesaspis gadovii (Gadow's Alligator Lizard). Saurophagy.** The distribution of *Mesaspis gadovii* is restricted to the highlands of the Sierra Madre del Sur, in the states of Guerrero and Oaxaca, Mexico, at elevations from 2,000 to 3,100 m (Flores-Villela and Gerez, 1994; Wilson and Johnson, 2010). Saurophagy often is an opportunistic behavior among lizards that may involve feeding on conspecifics (cannibalism) or heterospecifics, and is the result of normal predatory behavior (Galdino and Van Sluys, 2004). This behavior has been reported in different genera of reptiles, including *Anolis* (= *Ctenonotus*; Owen and Perry, 2005), *Aspidoscelis* (Alemán and Sunyer, 2014), *Cophosaurus* (Castañeda et al., 2005), *Leiocephalus* (Fong and del Castillo, 2002), *Liolaemus* (Ávila and Morando, 2002), *Phelsuma* (García and Vences, 2002), *Phrynosoma* (López-Vargas et al., 2012), *Sceloporus* (Luria-Manzano and Melgarejo-Vélez, 2011), *Tropidurus* (Galdino and Van Sluys, 2004), and *Varanus* (Blamires, 2000). No information, however, has been reported on saurophagy in *Mesaspis gadovii*, so this note represents the first record.

We examined a total of 16 specimens of *M. gadovii* from four different locations in the state of Guerrero (Carrizal de Bravo, El Alquitrán, La Ciénega, and Cerro Teotepec) deposited in the Colección Herpetológica del Instituto de Investigaciones Científicas, Área de Ciencias Naturales (IICACN) of the Universidad Autónoma de Guerrero, to search for endoparasites the digestive tract. We performed a ventral midline incision in all the specimens, and removed the stomachs and intestines. Subsequently, we found the stomach of a female (IICACN 976)



from Carrizal de Bravo (snout–vent length [SVL] = 79.89 mm) to contain, although in an advanced stage of digestion, fragments of the tail, extremities, and the back of the body (> 2 cm) of a young of *Sceloporus adleri* (Fig. 1A); both species, *M. gadovii* and *S. adleri*, occur sympatrically at Carrizal de Bravo. Additionally, were determined the stomach contents of a female (IICACN 595) from El Alquitrán (SVL = 98.1 mm), a female (IICACN 13) from La Cienega (SVL = 75.28 mm), and a male (IICACN 1293) from Cerro Teotepec (SVL = 79.84 mm), and collectively found invertebrate fragments corresponding to the orders Coleoptera, Hemiptera, Lepidoptera (larvae), and Orthoptera (Fig. 1B). Thus, we also report these as part of the diet of this species.



**Fig. 1.** Stomach contents retrieved from specimens of *Mesaspis gadovii*. (A) Close-up of the remains of a young *Sceloporus gadovii* (left) found in the stomach contents of IICACN 976 (right); and (B) invertebrate fragments found in the stomach contents of IICACN 595, IICACN 13, and IICACN 1293. 📷 © Rufino Santos-Bibiano

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***Sceloporus spinosus* Wiegmann, 1828. Diet.** *Sceloporus spinosus* is a species endemic to Mexico, with a distribution in the states of Aguascalientes, Coahuila, Colima, Distrito Federal, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, México, Michoacán, Morelos, Nuevo León, Oaxaca, Puebla, Querétaro, San Luis Potosí, Sinaloa, Sonora, Tamaulipas, Tlaxcala, Veracruz, and Zacatecas (Smith and Smith, 1976). This species is terrestrial and arboreal, and inhabits coniferous forest, oak forest, and xeric scrub (Smith, 1939; Flores-Villela and Gerez, 1994). *Sceloporus spinosus* is a large member of its genus that reaches a snout–vent length (SVL) of 100 mm (Canseco-Márquez and Gutiérrez-Mayén, 2010; Valdéz-Gonzalez and Ramirez-Bautista, 2002; Ramírez-Bautista et al., 2013).

Although Valdéz-González (1998) reported the diet of *S. spinosus* as consisting mainly of insects, such as coleopterans, formicids, vespids, and hemipterans, information on its feeding habits remains scarce. To date, this species has not been shown to feed on small vertebrates (Valdéz-González and Ramírez-Bautista, 2002; Ramírez-Bautista et al., 2013), as reported in small vertebrates such as other species of lizards, snakes, birds, and mammals (Best and Pfaffenberger, 1987; Moll and Koenig, 2003; Dalhuijsen et al., 2013; Robbins et al., 2013). To date, snakes have not been reported in the diet of *S. spinosus*.

On 14 August 1999, an adult male (CIB–4937) *S. spinosus* (SVL = 100.6 mm) was collected in the Municipio de Guadalcázar, San Luis Potosí, Mexico (22.650°N, 100.333°W; WGS 84; elev. 1,747 m). An analysis of the stomach contents revealed insects (formicids, lepidoteran larvae) and a neonate of the snake *Masticophis schottii* (CIB–4938) that measured 180 mm in total length; the body of the snake, however, was partially torn in three parts (Fig. 1).



**Fig. 1.** Dorsal view of an adult male *Sceloporus spinosus* (predator) and a snake *Masticophis schottii* (prey) found in its stomach contents.  © Fernando Hidalgo-Licona

The consumption of snakes by *S. spinosus* had not been recorded (Valdéz-González, 1998), and thus herein we present the first record. Our data indicate that this species not only is insectivorous but also carnivorous, and preys on snakes.

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***Sceloporus vandenburgianus* (Cope, 1886). Kyphosis and scoliosis.** Vertebral malformations like kyphosis and scoliosis have been recorded in lizards, snakes, and a few chelonians and crocodylians, and might be caused by genetic defects, environmental conditions, or metabolic bone diseases (Frye, 1991). Reports of reptile spinal malformations once were observed more frequently in captive animals compared to individuals from the wild (Frutos et al., 2006); however, reports of malformations in wild populations of reptiles now are more common, with most observations occurring in lizards (Frutos et al., 2006; Owens and Knapp, 2007; Feltrin et al., 2009; Norval et al., 2010; Avila et al., 2013; Pérez-Delgadillo et al., 2015). For the genus *Sceloporus*, kyphosis or scoliosis have been reported in *S. marmoratus* (Chávez-Cisneros and Lazcano, 2012), *S. undulatus* (Mitchell and Georgel, 2005), and *S. torquatus* (Pérez-Delgadillo et al., 2015).

*Sceloporus vandenburgianus* is a small phrynosomatid lizard that reaches a maximum snout–vent length [SVL] of 63 mm, with a distribution extending from the mountains of southern California to northern Baja California (Grismer, 2002). In Baja California, this species is restricted to the coniferous forests of the Sierra Juárez and Sierra San Pedro Mártir (Lovich and Grismer, 2009). No known reports of malformations have been published for this lizard.

On 10 June 2014, we collected a subadult male *S. vandenburgianus* (SVL = 50 mm; tail length = 67 mm) in the Sierra San Pedro Mártir, Municipio de Ensenada, Baja California, Mexico (30.94150°N, 115.48072°W; datum WGS 84; elev. 2,259 m). The lizard exhibited one vertical curvature of the spine (kyphosis) in the thoracic region (Fig. 1A). More posteriorly, alternating lateral curves (scoliosis) were present on the individual: one over the pelvic

girdle and six throughout the length of the tail (Fig. 1B). The lizard was active at 1750 h on a fallen tree log in pine forest habitat and the malformations appeared to have little effect on its locomotion. The specimen was collected under the permit SGPA/DGVS/02658/14, and deposited in the herpetological collection of the Universidad Autónoma de Baja California, Facultad de Ciencias at Ensenada (UABC 2092). To our knowledge, this is the first reported occurrence of these types of malformations in *S. vandenburgianus*.



**Fig. 1.** A subadult *Sceloporus vandenburgianus* with kyphosis and scoliosis. (A) Lateral view of the animal in life; and (B) dorsal view of the preserved specimen (UABC 2092). © Jorge H. Valdez-Villavicencio

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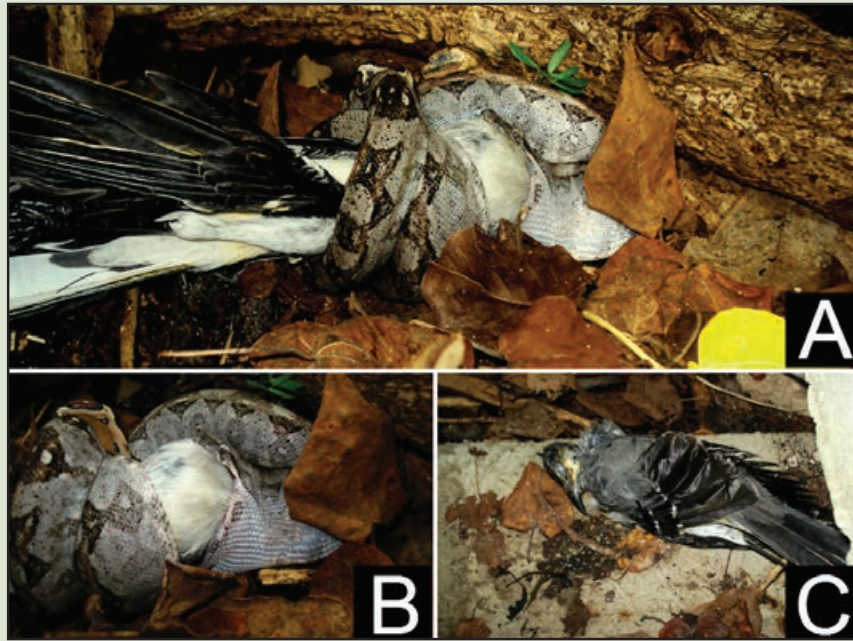
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## Reptilia: Squamata (snakes)

***Boa imperator* Daudin, 1803. Diet.** The Mesoamerican Boa Constrictor, *Boa imperator*, is distributed from northern Mexico, in Sonora and Tamaulipas, to northwestern South America (Hynková et al., 2009). The species is composed of populations previously assigned to three subspecies of *B. constrictor*: *B. c. imperator*, *B. c. longicauda*, and *B. c. sabogae* (Hynková et al., 2009); recently, however, Card et al. (*In Press*) proposed recognition of the lineage along the Pacific coast of Mexico, west of the Isthmus of Tehuantepec, as a distinct species, *B. sigma*. The diet of the snakes of the genus *Boa* is broad and includes a variety of mammals, birds, frogs, and lizards (Solórzano, 2004; Pérez-Higareda et al., 2007). At least 54 different prey items have been reported in the literature for mainland *Boa*, but reports of bird consumption are relatively rare (Boback, 2005). Most of the birds accounted as prey are passerines, but domestic fowl, New World vultures, and hummingbirds have been reported in the diet of *B. imperator* (Boback, 2004; Platt et al., 2016).

On 6 December 2015 at ca. 1200 h, at Hotel Xixim, ca. 9.7 km NNE of Celestún, Yucatán, Mexico (20.9439 N, 90.3708 W, WGS 84; elev. 5 m), we observed a juvenile *B. imperator* attempting to consume an adult Tropical Mockingbird, *Mimus gilvus* (Fig. 1A). The incident took place above a covered water tank located under a tree, in a shaded area with relatively dense undergrowth. The vegetation at the site was disturbed tropical dry forest. The snake was firmly coiled around the bird's body and had swallowed it to around the chest level (Fig. 1B). By the time we arrived the bird was dead, so we are not certain if it was a predatory or scavenging event. Scavenging has been reported for the closely related Puerto Rican Boa *Chilabothrus inornatus* (Rodríguez-Durán, 1996), but the fact that the snake was strongly coiled around the bird's body suggests the event was predatory. After around 5 min of observing the occurrence, we left the area to avoid further disturbing the snake. We returned to the site ca. 30 min later and the snake had left, leaving the bird behind (Fig. 1C). We are unaware of what caused the snake to desist ingestion, but possibly the food item was too large or the snake was disturbed by us and some of the hotel's workers, as they had approached to observe it.

*Mimus gilvus* has been reported in the diet of introduced *B. constrictor* in Aruba (Quick et al., 2005; Bushar et al., 2015), but to our knowledge the incident reported herein constitutes the first record of either attempted or achieved ingestion of *M. gilvus* by *B. imperator*.



**Fig. 1.** (A) Ingestion attempt of *Mimus gilvus* by *Boa imperator* at Hotel Xixim, ca. 9.7 km NNE of Celestún, Yucatán, Mexico; (B) a close-up of the snake's head during the swallowing process; and (C) the abandoned bird carcass.

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***Clelia clelia* (Daudin, 1803). Predation.** *Clelia clelia* is a large snake that can reach an estimated total length (TL) of 2,750 mm (Solórzano, 2004). It also has a large geographic distribution extending from Guatemala to western Peru west of the Andes, and to central Bolivia, Argentina, and northern Brazil east of the Andes (McCranie, 2011). This species is common in the Mosquitia region of northeastern Honduras, in areas of primary broadleaf rainforest. *Clelia clelia* is listed as a CITES (II) species.

On 27 July 2015, about three hours after nightfall, my group captured a subadult *Clelia* (slightly less than 2 m TL) crawling on the ground in undisturbed broadleaf rainforest. We placed the snake in a cloth bag for photographing the next day, and carried it for 3.5 h before returning to our campsite. The campsite was at a site called Bachi (“catfish” in English) Kiamp (15°08.654'N, 84°24.942'W; elev. 40 m) that belongs to the Miskito people.

The following morning we noticed a stench coming from the bag with the *Clelia*, and upon opening it discovered several regurgitated prey items. The snake was bleeding from the mouth, so we released immediately it in primary forest. Apparently the bleeding had resulted from the regurgitation process, as we handled the snake gently when capturing it. The regurgitated items included a young *C. clelia*, still with its juvenile color pattern, an adult of the teiid *Holcosus festivus*, and two small mammals that appear to be mouse pups (Figs. 1A, B).

McCranie (2011; also see references cited therein) reported the following food items for *C. clelia*: rats and other small mammals; birds; various lizards; and various snakes, including the venomous *Bothrops asper* and other viperids. *Clelia clelia* is a generalist feeder well known for feeding on venomous viperid snakes. Lee (1996; also see references cited therein) reported similar food items, and Solórzano (2004) reported a similar varied diet, but added three venomous viperid species from Costa Rica: *Atropoides mexicanus*, *Lachesis stenophrys*, and *Porthidium nasutum*. Solórzano (2004: 204) also made the general feeding statement of “small mammals and lizards.” Chavarría and Barrio-Amorós (2014) added the venomous snake *Bothriechis schlegelii* from Costa Rica. Gaiarsa et al. (2013; also see references listed therein) similarly listed various snakes and lizards as prey, plus small mammals and birds, and made the first report of snake eggs as prey of a Brazilian specimen.

This apparently is the first report of cannibalism in *C. clelia*. Also, although teiid lizards have been reported in the diet of *C. clelia* (see above references), this report is the first to include *H. festivus* in the diet of this species.





**Fig. 1.** Regurgitated food items from a *Clelia clelia* captured in the Mosquitia region of northeastern Honduras. (A) A juvenile *C. clelia* and a *Holcosus festivus*; and (B) two small mammals. © James R. McCranie

**Acknowledgments.**—I thank my mother-in-law, Melissa, for cooking, washing clothes, and other courtesies for nearly two weeks under primitive conditions. Also, I thank two brother-in-laws, Emiliano and Mario, and a cousin, Mardo, for their hard fieldwork in the forest and with the boat on the river. Neil Woodman (USNM) made a general identification of the two small mice.

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***Crotalus basiliscus*. Arboreal habitat use/ Litter size.** The Mexican West Coast Rattlesnake, *Crotalus basiliscus*, is a large Mexican endemic known to reach a total length of 2,045 mm (Klauber, 1972). This species inhabits the Mexican Pacific coast and canyons west of the Sierra Madre Occidental, from southwestern Chihuahua and southern Sonora to northern Michoacán, including the northern Tepalcatepec Valley, the Balsas Basin, and the Santiago Basin, at elevations from sea level to 2,900 m (Ponce-Campos and García-Aguayo, 2007). Little information is available on the behavior of this snake, other than it most active during the rainy summer months and often crosses roads at night, and that some individuals have been encountered basking early in the morning (Campbell and Lamar, 2004; Lemos-Espinal and Smith, 2009).

Published reports of rattlesnakes resting, foraging, and feeding above ground include the following species: *C. adamanteus*, *C. atrox*, *C. catalinensis*, *C. cerastes*, *C. durissus*, *C. enyo*, *C. horridus*, *C. lepidus*, *C. mitchellii*, *C. molossus*, *C. helleri*, *C. lorenzoensis*, *C. tigris*, *C. viridis*, *C. willardi*, and *Sistrurus miliaris* (Cunningham, 1955; Klauber, 1972; Campbell and Lamar, 2004 [and references therein]; Santos-Dayrell et al., 2010; Walde et al., 2016). Martins (1993) suggested that by resting above the ground snakes might be less vulnerable to terrestrial predators, or they might climb to escape from water and flooding (Shine et al., 2005) or to capture prey (Martins et al., 2008). Another hypothesis for such arboreal behavior is that snakes can thermoregulate in the sun-shade mosaic formed by vegetation, a behavior commonly observed in the pitviper *Bothrops jararaca* (Sazima, 1988). Rudolph et al. (2004) and Figueroa et al. (2008) noted that juveniles and subadults of several snake species use arboreal habitats more frequently than adults for the purpose of foraging. With respect to *C. basiliscus*, the litter sizes reported for this species range from 14 to 60 young, with an average 33 (Lemos-Espinal and Smith, 2009). In this note we describe arboreal habitat use in the neonates of *C. basiliscus*, and also provide information on litter size.

On 10 September 2014 at 1300 h, at La Escondida, Tepic, Nayarit, Mexico (21.580166°N, -104.911825°W; WGS 84; elev. 796 m) we found a juvenile *C. basiliscus* in tropical deciduous forest, resting on branches at ca. 75 cm above the ground (Fig. 1). The following year, on 6 July 2015 at 1110 h, at El Marqués, Ahuacatlán, Nayarit, Mexico (21.065803°N, -104.554320°W; WGS 84; elev. 942 m), we found a litter of 21 neonates and an adult female *C. basiliscus* in tropical deciduous forest. Nine of the neonates were resting on branches at a height of 15–90 cm above the ground (Fig. 2), and 12 neonates were located inside a burrow along with an adult female (Fig. 3). We suggest that the juvenile individual (Fig. 1) was resting above the ground to avoid predation, but due to recent rains the nine neonates (Fig. 2) perhaps climbed the branches to partake in thermoregulatory behavior. Photo vouchers were deposited at the Museo de Zoología, Unidad Académica de Agricultura, Universidad Autónoma de Nayarit (MZUAN AR F0011, MZUAN AR F0012, MZUAN AR F0013).



**Fig. 1.** A juvenile *Crotalus basiliscus* resting on vegetation ca. 75 cm above the ground at La Escondida, Tepic, Nayarit, Mexico. © Roy R. Navarro-Orozco



**Fig. 2.** We observed nine neonates of *Crotalus basiliscus* resting on vegetation at 15–90 cm above the ground, at El Marquésado, Ahuacatlán, Nayarit, Mexico. 📷 © Jesús A. Loc-Barragán



**Fig. 3.** An adult female and neonates of *Crotalus basiliscus* located within a burrow at El Marquésado, Ahuacatlán, Nayarit, Mexico. 📷 © Jesús Loc

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***Crotalus intermedius* Troschel, 1865. Arboreality.** The Mexican Small-headed Rattlesnake, *Crotalus intermedius*, is a small venomous snake with a relatively limited and disjunct geographic distribution. This species is endemic to Mexico, and has been reported from the states of Hidalgo, Puebla, Tlaxcala, Veracruz, Guerrero, and Oaxaca (Campbell and Lamar, 2004). In Oaxaca it is known to occur in the Sierra de Juárez (Cerro San Felipe and its associated ridges), the Sierra de Cuatro Venados, and the Sierra Madre del Sur (more specifically, in the Sierra de Miahuatlán). This species inhabits dry pine-oak forest, cloud forest, and desert, and its elevational range extends from 2,000 to over 3000 m (Campbell and Lamar, 2004). Little information, however, is available on its natural history, including behavior.

On 13 August 2013 at 1240 h, two of us (CARP and EGP) observed an adult *C. intermedius* near El Punto Ixtepeji, Municipio de Santa Catarina Ixtepeji, Oaxaca, Mexico (17°14'25.97"N, 96°33'27.02"W; WGS 84; elev. ca 2,330 m). The snake was found thermoregulating in montane pine-oak forest, on the main trunk of a large pine tree, ca. 1.5 m above the ground (Fig. 1). Although *C. intermedius* is considered a terrestrial species, our observation suggests that arboreal behavior occasionally may be used while thermoregulating, or possibly foraging. During the same visit we also observed the lizards *Norops quercorum*, *Sceloporus formosus*, and *S. grammicus* active on pine trees, which might represent potential prey. To the best of our knowledge this observation represents the first published report of arboreal behavior in *C. intermedius*.



**Fig. 1.** An Adult Small-headed Rattlesnake (*Crotalus intermedius*) displaying arboreal behavior on the vertical trunk of a pine tree in Municipio de Santa Catarina Ixtepeji, Oaxaca, Mexico. © ©  © **Ciro A. Rodríguez-Pérez**

**Acknowledgments.**—A special thanks to the people of El Punto Ixtepeji for kindly allowing CARP and EGP to explore their communal land, which contains minimally disturbed natural habitat.

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***Ficimia publia*. Reproduction.** The Blotched Hook-nosed Snake, *Ficimia publia* Cope, 1866, is found at low elevations on the Atlantic versant from Veracruz, Mexico, to northwestern Honduras, and on the Pacific versant from southern Puebla and Guerrero, Mexico, to Guatemala (McCranie, 2011). Hardy (1980) summarized the biology of *F. publia*. Information on reproduction consists of a clutch of two oviductal eggs produced by one individual of *F. publia* from Belize (Greer, 1966). In this note I add information on the reproductive cycle of *F. publia* from a histological examination of museum specimens.

I examined eight *F. publia* from Mexico, three males (mean snout–vent length [SVL] = 324.3 mm ± 30.7 SD, range = 292–353 mm) and five females (mean SVL = 264.8 mm ± 20.5 SD, range = 245–295 mm) deposited in the herpetology collection of the University of Colorado Museum (UCM), Boulder, Colorado, United States: Chiapas: UCM 49852; Oaxaca: UCM 39925; Quintana Roo: UCM 40234–40236, 41696, 41697, 52566. The snakes were collected from 1968 to 1972.

I removed the left ovary from females and the left testis and vas deferens from males for histological examination, and embedded the tissues in paraffin, cut into 5µm sections, mounted on glass slides, and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreiber, 1997). I examined the slides to ascertain the stage of the testicular cycle or the presence of yolk deposition. I counted oviductal eggs or enlarged ovarian follicles (> 10 mm length), but did not examine them histologically, and deposited the histology slides at UCM.

The testicular histology was similar to that reported by Goldberg and Parker (1975) for the colubrid snakes, *Masticophis taeniatus* and *Pituophis catenifer* (as *P. melanoleucus*). The only stage present in the testicular cycle was spermiogenesis, in which the seminiferous tubules were lined by sperm or clusters of metamorphosing spermatids. Vasa deferentia contained sperm. Males came from the following months: March UCM 39925, SVL = 353 mm; April UCM 52566, SVL = 328 mm; November UCM 40235, SVL = 292 mm. The presence of males undergoing spermiogenesis at opposite ends of the year suggests a prolonged period of sperm formation.

Three of the five *F. publia* females examined were reproductively active: (1) May UCM 41696, SVL = 247 mm, early yolk deposition; (2) August UCM 40236, SVL = 245 mm, two enlarging eggs (> 10 mm length); (3) September UCM 40234, SVL = 272 mm, three oviductal eggs; and (4, 5) January UCM 41697, SVL = 265 mm, July UCM 49852, SVL = 295 mm, July, both no yolk deposition. The presence of female reproductive activity late in the season suggests a prolonged ovarian cycle. Three is a new maximum clutch size for *F. publia*.

Additional *F. publia* need to be examined to ascertain the timing of events in the reproductive cycle.

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***Imantodes gemmistratus*. Endoparasites.** To our knowledge, only one study on endoparasites of the Central American Treesnake (*Imantodes gemmistratus*) exists, reporting one oligacanthorhynchid cystacanth from 12 individuals of *I. gemmistratus* from Costa Rica preserved in the herpetological collection of the Natural History Museum of Los Angeles County (Goldberg and Bursey, 2009). On 27 June 2014 we collected a specimen of *I. gemmistratus* (snout-vent length = 46.5 cm, mass = 16.4 g) at Nuevo Pochote, Municipio de Emiliano Zapata, Tabasco, Mexico (17.83543°N, 91.69940°W; datum WGS 84; elev. 14 m) (Charruau et al., 2015), and deposited it in the Colección de Anfibios y Reptiles de Tabasco, División Académica de Ciencias Biológicas, Universidad Juárez Autónoma de Tabasco (CART 00732). Before its deposition in the collection, we opened the snake by a longitudinal incision on ventral side to observe the internal organs and mesenteries for parasitological examination. We collected 11 cystacanths encysted in the mesentery. We cooled these helminths in filtered water for 24 h, allowing them to invert the proboscis. Then, they were fixed with alcohol 70%, stained in hematoxylin and mounted in Canada balsam for examination.

The 11 collected cystacanths corresponded to the family Oligacanthorhynchidae and were deposited in the Colección Parasitológica del Sureste de México (CPSM), División Académica de Ciencias Biológicas, Universidad Juárez Autónoma de Tabasco (AC-R-004-001). Although this second study of helminths in *I. gemmistratus* reports the same parasite found by Golberg and Bursey (2009) for this species in Costa Rica, this is the first report of parasitic worms in *I. gemmistratus* from Mexico. In Mexico, eight species of the family Oligacanthorhynchidae have been recorded in amphibians (*Lithobates forreri*, *L. tarahumarae*, *L. vaillanti*, *Pachymedusa* [= *Agalychnis*] *dacnicolor*, *Rhinella marina*, *Smilisca cyanosticta*, and *Rhinella marina*), reptiles (*Phrynosoma ditmarsii*, *Urosaurus nigricaudus*, *Coluber* [= *Masticophis*] *mentovarius*, *Conopsis lineata*, *Crotalus willardi*, *Leptodeira maculata*, *Oxybelis aeneus*, *Rhinocheilus lecontei*, *Salvadora mexicana*, and *Trimorphodon tau*), birds (*Buteo lineatus*) and mammals (*Didelphis marsupialis*, *D. virginiana*, *Nasua narica*, *Philander opossum*, and *Spilogale pygmaea*) (García-Prieto et al., 2010). Species of *Imantodes* likely are parasitized by helminths via the ingestion of infected frogs (Golberg and Bursey, 2009).

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***Masticophis mentovarius* (Duméril, Bibron & Duméril, 1854).** **Diet.** The Neotropical Whipsnake, *Masticophis mentovarius*, is a large colubrid (maximum snout–vent length = 2,527 mm; Johnson, 1977), with a distribution on the Atlantic versant that extends from San Luis Potosí, Mexico, to Honduras, and in northern South America on the Guajira Peninsula of Colombia and Venezuela, as well as in north-central Venezuela and Isla Margarita; on the Pacific versant, its distribution ranges from Sonora, Mexico, southward to central Panama; its elevational distribution has been reported as from sea level to 2,500 m (Johnson, 1982; Wilson and Johnson, 2010; Knight et al., 2016). This species is diurnal and terrestrial, but can climb low on vegetation and often is found in open areas (Campbell, 1998). Its diet consists of arthropods, fishes, amphibians, lizards, snakes, small turtles, birds and their eggs, and mammals (Savage, 2002; Solórzano, 2004; Bernarde and Abe, 2010; Calderón-Patrón et al., 2011; Martínez-Fonseca and Sunyer, 2015).

*Masticophis mentovarius* is known to prey on such amphibians as *Leptodactylus* (= *Adenomera*) *andreae*, *Lithobates forreri* (L. Porras and L. Wilson, pers. comm.), and reptiles *Ameiva* (= *Holcosus*) sp., *Anolis* (= *Norops*) *cupreus*, *Aspidoscelis sackii*, *Ctenosaura* sp., *Sceloporus cozumelae*, *Conopsis lineatus*, and predatory attempts have been reported on individuals of *Boa constrictor* (= *imperator*) and *Crisantophis nevermanni*; it also is known to prey on the following mammals: *Rattus rattus*, and *Tlacuatzin canescens* (Lee, 1996; Gutiérrez-Mayén, 2001; Savage, 2002; Pérez-Higareda et al., 2007; Dugan and Figueroa, 2008; Bernarde and Abe, 2010; Calderón-Patrón et al., 2011; Martínez-Fonseca and Sunyer, 2015).

On 9 July 2007, at the campus of the Universidad de Guadalajara (20°42'14.82"N, 105°13'17.9"W; datum WGS 84; elev. 10 m) in Puerto Vallarta, Jalisco, Mexico, we observed a *M. mentovarius* (total length  $\leq$  1 m) eating a live juvenile Brown Basilisk, *Basiliscus vittatus* (Fig. 1). The total time elapsed from capture to swallowing the lizard was about 5 min. This note represents the first record of *M. mentovarius* preying on *B. vittatus*. The individual was not captured.



**Fig. 1.** Predation by a *Masticophis mentovarius* on a *Basiliscus vittatus* observed in Puerto Vallarta, Jalisco, Mexico. (A) *Masticophis mentovarius* bites and subdues a *B. vittatus*; (B, C) the *B. vittatus* attempts to escape by biting the *M. mentovarius*; and (D) the *M. mentovarius* swallows the *B. vittatus*.  © Frank Mc Cann

**Acknowledgments.**—We thank Larry David Wilson and Louis Porras for verifying the identification of the snake.



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***Micrurus diastema* (Duméril, Bibron & Duméril, 1854). Arboreal behavior.** Coralsnakes (*Micrurus* spp.) primarily are fossorial and secretive, although arboreal behavior has been reported in four species (*M. circinalis*, *M. fulvius*, *M. nigrocinctus*, and *M. surunamensis*; Dávila et al., 2014). Here we report arboreal behavior in an adult *M. diastema*.

The distribution of *M. diastema* extends from from northeastern Mexico to Honduras (Roze, 1996). In Mexico, this elapid is known to occur in the states of Hidalgo, Puebla, Oaxaca, Veracruz, and Yucatán (Roze, 1996; Campbell and Lamar, 2004; Fernández-Badillo et al., 2011; Ramírez-Bautista et al., 2014). This medium sized species (snout–vent length 500 to 750 mm) is diurnal and nocturnal, and preys primarily on small snakes and lizards; cannibalism also has been reported (Fernández-Badillo et al., 2011). Typically regarded as a terrestrial snake, *M. diastema* can be found under trash, rocks, or logs (Roze, 1996).

On 23 November 2010 at 1033 h, at ca. 0.83 km SW of Coatapa, Municipio de Atlapexco, Hidalgo (21°04'12.69"N, 98°22'51.18"W; elev. 309 m), we observed and photographed an adult *M. diastema* (ca. 60 cm in total length) in semi-deciduous tropical forest, stretched vertically on a creeper plant (*Arrabidaea* sp.) at a height of 40 cm, near a cluster of small understory shrubs (Fig. 1). The snake remained in this position for several minutes, then

quickly descended to the ground and escaped down a cliff. This report is the first to document arboreal behavior in *M. diastema*. It also represents a municipality record, extending range 47 km NE from the nearest recorded locality in the municipality of Molango de Escamilla, Hidalgo (Ramírez-Bautista et al., 2010).

A photo voucher of the snake (CH-CIB 53) is deposited in the photographic collection of the Herpetological Collection of the Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Hidalgo.

**Acknowledgments.**—We thank Michele García-Conejo and Rosario Medrano for help with logistics in the field. We also acknowledge David Aguillón Gutiérrez for reviewing and helping to translate the text, and Luis Canseco-Márquez for corroborating the identification of the species.

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**Fig. 1.** An adult *Micrurus diastema* (CH-CIB 53) showing arboreal behavior in understory vegetation at Coatapa, Municipio Atlapexco, Hidalgo, Mexico.

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***Rena maxima* (Giant Blindsnake). Clutch size and maximum length.** *Rena maxima* is a Mexican endemic with a distribution along the Cuenca del Río Balsas (Balsas River Basin) in the states of Guerrero, Morelos, México, Puebla, and Oaxaca at elevations from 800 to 1,500 m; this species is fossorial and inhabits primary and secondary dry scrubland and tropical deciduous forest, where it can be found under rocks or buried in humid places (Canseco Márquez and Mendoza-Quijano, 2007; Canseco-Márquez and Gutiérrez-Mayén, 2010). This snake is considered one of the largest members of the genus *Rena*, reported to reach a snout–vent length (SVL) of 305 mm (Loveridge, 1932; Woolrich-Piña et al., 2005; Canseco-Márquez and Gutiérrez-Mayén, 2010). Its reproductive mode is oviparous, and a female is known to have deposited three eggs in late September (Canseco-Márquez and Gutiérrez-Mayen, 2006). Herein we report on two specimens of *Rena maxima*, one with the maximum body size and the other with the largest clutch size known for this species.

On 21 March 2014 we found a specimen of *R. maxima* (IICACN-1646; SVL = 330 mm; tail length [TL] = 18 mm; body mass = 15.3 gr) dead on the road at Chilpancingo de los Bravo, Guerrero (17.32493°N, 99.29928°W; WGS 84), elev. 1,261 m. This specimen represents the maximum length (SVL) recorded for this species (> 305 mm; Woolrich-Piña et al., 2005; Canseco-Márquez and Gutiérrez-Mayén, 2010). Subsequently, on 6 May 2014 we collected another specimen (IICACN-1647; SVL = 286 mm; TL = 12.65 mm; body mass = 12.5 gr) at the same locality (17.32567°N 99.31593°W; WGS 84), elev. 1,513 m. After making a midventral incision to determine the sex and reproductive condition of the specimens, we found that both were females and each contained seven eggs (Fig. 1). These results show a larger clutch size for the species, compared with that reported by Canseco-Márquez and Gutiérrez-Mayen (2006). We show the morphometric data for the eggs in Table 1. The Relative Clutch Mass (RCM) was calculated using the alternative method proposed by Rodríguez-Romero et al. (2005). The RCM does not show the maximum values for the species, because the eggs were not found in the final stages of development (> 40) (Dufaure and Hubert, 1961).

We deposited the specimens in the Colección Herpetológica del Instituto de Investigaciones Científicas, Área de Ciencias Naturales (IICACN) de la Universidad Autónoma de Guerrero (numbers 1646 and 1647, respectively).



**Fig. 1.** Specimens of *Rena maxima* with their respective egg clutches (IICACN-1647 left, IICACN-1646 right).

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**Table 1.** Mean values for the morphometric measurements of the eggs  $\pm$  standard deviation, with the corresponding intervals shown in parentheses. The variables are presented in millimeters (mm), except for the volume which is in cubic millimeters ( $\text{mm}^3$ ), and the mass was taken in grams (g).

Specimen	SVL (mm)	Number of Eggs	Clutch Mass (g)	Egg Mass	Length	Width	Volume	RCM
IICACN 1646	330	7	4	$0.57 \pm 0.09$ (0.4–0.7)	$19.32 \pm 1.59$ (16.4–20.46)	$6.93 \pm 0.38$ (6.45–7.45)	$485.87 \pm 53.99$ (425.20–566.20)	0.4
IICACN 1647	286	7	2	$0.28 \pm 0.037$ (0.2–0.3)	$16.09 \pm 1.35$ (15.07–17.79)	$5.56 \pm 0.27$ (5.11–5.9)	$259.58 \pm 14.22$ (246.45–279.77)	0.19

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***Senticolis triaspis* (Cope, 1866). Diet.** *Senticolis triaspis* is a moderate-sized colubrid that kills its prey by constriction, and is known to feed on lizards, birds and their eggs, and small mammals (Savage, 2002; Stebbins, 2003). Two records of this snake feeding on bats in caves have been reported: *Glossophaga soricina* in Honduras (Mankins and Meyer, 1965) and *Eptesicus fuscus* in Mexico (Rodríguez-Canseco and Quiroz, 2013).

On 15 December 2015 at 1635 h, in Parque Nacional Volcán Masaya (11.97905°N, 86.16770°W), elev. 477 m, Departamento de Masaya, Nicaragua, JGMF and FAR observed an adult *S. triaspis* right after it swallowed an adult bat (*Carollia perspicillata*) at the southern entrance of La Bruja cave, which is a portion of a tunnel of magmatic origin situated relatively close to the volcano crater. The event took place at ground level ca. 20 m inside the cave, in total darkness. The general area surrounding that cave contains well-preserved patches of Lowland Dry Forest (Holdridge, 1967; Savage, 2002), which are affected by the constant volcanic activity of Volcán Masaya.



**Fig. 1.** A *Senticolis triaspis* with a recently ingested *Carollia perspicillata* at La Bruja cave in Parque Nacional Volcán Masaya, Nicaragua. © José Gabriel Martínez-Fonseca

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# DISTRIBUTION NOTES

## Amphibia: Anura

### Family Craugastoridae

*Craugastor noblei* (Barbour and Dunn, 1921). HONDURAS: OLANCHO. Municipio de la Unión, on a dirt road from the visitors center at Refugio de Vida Silvestre La Muralla to El Dúctamo (15°05'49.7"N, 86°44'18.0"W, WGS 84); elev. 1,471 m; 9 August 2015; Manfredo Turcios. The individual (Fig. 1), an adult female (snout–vent length = 67.3 mm), was encountered at 2030 h and given to the author, who deposited it at the educational collection in the Laboratorios de Zoología, Escuela de Biología, Facultad de Ciencias, Universidad Nacional Autónoma de Honduras (UNAH), Tegucigalpa, Honduras. McCranie and Wilson (2002) previously recorded *Craugastor noblei* from this general area. The elevational record for this species is from Nicaragua (1,330 m; Sunyer and Köhler (2010), and this specimen increases the known elevation by 141 m.



**Fig. 1.** An adult female *Craugastor noblei* from the vicinity of Refugio de Vida Silvestre La Muralla, Departamento de Olancho, Honduras, which represents a new elevational record for the species.  © Kevin O. Sagastume-Espinoza

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## Reptilia: Squamata (lizards)

## Family Dactyloidae

*Norops pentaprion* (Cope, 1862). NICARAGUA: MATAGALPA: Municipio de Matiguás, Comarca de Paiwas (12.90582°N, 85.305218°W; WGS 84); elev. 335 m; 10 November 2008; Allan A. Gutiérrez Rodríguez. Two photo vouchers of this individual are deposited at The University of Texas at Arlington Digital Collection (UTADC-8641, 8642; Fig. 1A, B). An adult male of this species was found during the day (1510 h) moving along the base of a ceiba tree (*Ceiba pentandra*) ca. 2 m above the ground, in an anthropogenized riparian area consisting of Tropical Moist Forest (Holdridge, 1967; Savage, 2002). NICARAGUA: MATAGALPA: Municipio de Muy Muy, Comarca Las Lomas, between Finca Las Lomas and Finca El Ranchero (12.76992°N, 85.50907°W; WGS 84); elev. 264 m; 9 September 2013; Nelson Toval Herrera. A photo voucher of this individual is deposited at The University of Texas at Arlington Digital Collection (UTADC-8643; Fig. 1C). An adult male of this species was found during the day (1020 h) moving along a wooden pole used to attach barbwire, ca. 1.5 m above the ground, in a pasture consisting of Tropical Moist Forest (Holdridge, 1967; Savage, 2002). The fence was attached to wooden poles and trees (mostly *Bursera simaruoba* and *Gliricidia sepium*) that separated different pastures, which contained scattered arboreal cover.

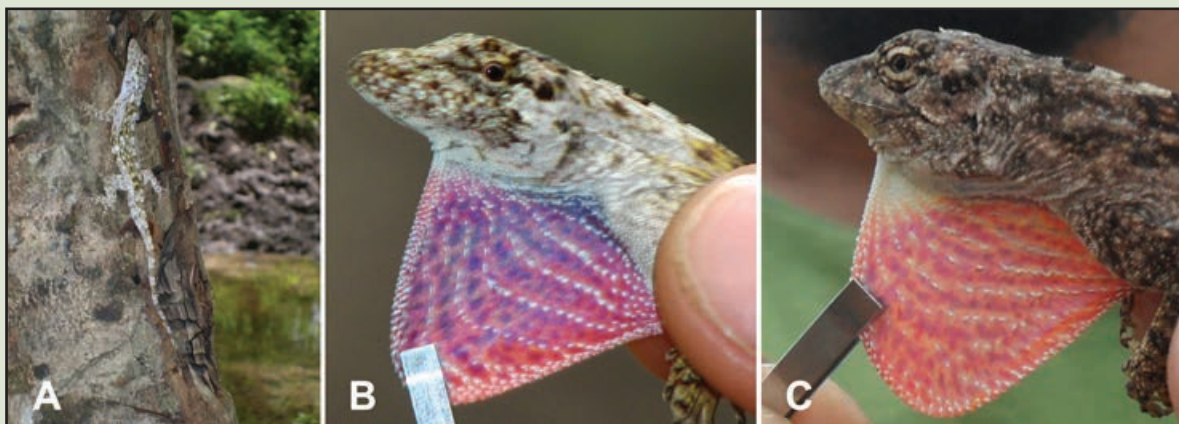


Fig. 1. (A) Whole body and (B) detail of the dewlap of an adult male *Norops pentaprion* from Paiwas; and (C) detail of the dewlap of an adult male *N. pentaprion* from Las Lomas. Departamento de Matagalpa, Nicaragua.

© Allan A. Gutiérrez Rodríguez (A, B) and Nelson Toval Herrera (C)

These two localities, ca. 27 km apart, represent the first records of *N. pentaprion* for the department of Matagalpa and the northernmost records for this species, and extend its distribution ca. 130 km NE and 135 km NW from its closest reported localities at Volcán Mombacho (Departamento Granada) and Río Siquia (Departamento Atlántico Sur), respectively (Köhler, 2010). Additionally, the Paiwas locality leaves a ca. 145 km gap between the closest records of *N. pentaprion* and the closely related *N. beckeri* (Köhler, 2010). Because no major geographic or climatic barriers occur between these two general localities, conceivably both species might occur in sympatry somewhere in the central-northern Atlantic lowlands of Nicaragua, a rather deforested and relatively poorly sampled area.

**Acknowledgments.**—We thank Carl J. Franklin for providing the photo voucher numbers.

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### Family: Gekkonidae

***Hemidactylus turcicus* (Linnaeus, 1758).** MEXICO: OAXACA. Municipio de Juchitán de Zaragoza, Juchitán de Zaragoza (16°26'5.40"N 95°1'7.29"W; WGS 84); elev. 22 m; 26 March 2016; Julio César Bolán-Mata. A photograph of this specimen is deposited in the University of Texas at El Paso Biodiversity Digital Collection (Photo Voucher UTEP G-2016.10). The lizard was found at 1010 h, concealed in a pile of bricks and wood in the yard of a local home. The site is located in the middle of the city, ca. 5.8 km E of Río Los Perros, in the Planicie Costera de Tehuantepec physiographic region (Mata-Silva et al., 2015). This individual (Fig. 1) represents the first record of *H. turcicus* from the state of Oaxaca, with the closest reported locality ca. 153 km ESE in the Reserva de La Biósfera La Sepultura, in the state of Chiapas, Mexico (Nuñez-Orantes and Muñoz-Alonso, 2000).





**Fig. 1.** An adult *Hemidactylus turcicus* (UTEP G-2016.10) from Juchitán de Zaragoza, Municipio de Juchitán de Zaragoza, Oaxaca, Mexico.  © Julio César Bolán-Mata

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## Family Scincidae

*Mesoscincus altamirani* (Dugès, 1891). MEXICO: GUERRERO: Municipio de Atenango del Río, near Temalac (18°07'56.7"N, 98°54'55.5"W) elev. 1,304 m; 5 September 2015; Víctor H. Jiménez-Arcos and Cesar Toscano-Flores. The individual was collected and deposited at the Colección Nacional de Anfibios y Reptiles (CNAR), Universidad Nacional Autónoma de México (IBH-31086; Fig. 1). The lizard was found inside a rock crevice at 1115 h., in habitat characterized by an ecotone between oak forest (*Quercus* sp.) and *Brahea dulcis* (i.e. rock palm). This individual represents the third known locality for the state of Guerrero (Alvarado-Díaz and Suazo-Ortuño, 2005; Mendoza-Hernández et al, 2011), the easternmost locality for the species, and a new municipality record. The two closest localities are ca. 131 km W (airline distance) in Campo Morado, Municipio de Arcelia and ca. 90.4 km W near the vicinity of Xochipala, Municipio de Eduardo Neri, both in the state of Guerrero (Mendoza-Hernández et al., 2011). This species likely occurs in the state of Puebla, because of the proximity of this new locality with the border of the state (ca. 4.2 km) and the similar type of vegetation.



Fig. 1. A *Mesoscincus altamirani* (IBH-31086) from near Temalac, Municipio de Atenango del Río, Guerrero, Mexico.

© Rafael Alejandro Calzada-Arciniega

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## Reptilia: Squamata (snakes)

### Family Boidae

***Boa imperator* (Daudin, 1803).** MEXICO: CHIAPAS. Municipio de Ocosingo, Zona Arqueológica y Área Natural Protegida “Monumento Natural Yaxchilán”(16°53'52.02"N 90°57'40.17"W; WGS 84), elev. 115 m; 28 December 2008; Elí García-Padilla and Pablo Chavarría-Gutiérrez. A photograph of this specimen is deposited in the University of Texas at El Paso Biodiversity Digital Collection (Photo Voucher UTEP G-2016.9). Based on the most recent checklist for Monumento Natural Yaxchilán (Ferreira-García and Canseco-Márquez, 2006), this individual (Fig. 1) represents a new record for this natural protected area. The snake was found in tropical evergreen forest, coiled on the ground on a bank of the Río Usumacinta.



**Fig. 1.** A *Boa imperator* (UTEP G-2016.9) from Zona Arqueológica y Área Natural Protegida “Monumento Natural Yaxchilán,” Municipio de Ocosingo, Chiapas, Mexico.  © Elí García-Padilla

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## First record and distribution extension of *Enulius flavitorques* (Cope, 1869) (Squamata: Colubridae) in Tabasco, Mexico

The Pacific Long-tailed Snake, *Enulius flavitorques*, occurs at low and moderate elevations on the Pacific versant from Jalisco, Mexico, to Panama, and on the Atlantic versant in Chiapas, Mexico, Honduras (including Isla Utila in the Islas de la Bahía), Panama, northern Colombia, and northwestern Venezuela (McCranie, 2011).

During 2014 we conducted biodiversity surveys along the coast of Municipio de Paraiso, Tabasco, Mexico, primarily in coconut plantations at Playa de Chiltepec. The climate in coastal Tabasco is warm-humid with an average temperature of 27°C, with abundant rainfall throughout the year (García, 1970). We found two specimens of *E. flavitorques* under coconut husks in a plantation (18°25'43"N, 93°2'50"W; WGS 84; elev. 18 m), which we collected and deposited in the Colección de Anfibios y Reptiles de Tabasco, División Académica de Ciencias Biológicas, at the Universidad Juárez Autónoma de Tabasco (CART 0738, 0739) (Fig. 1). These specimens represent the first records for the state, and extend the distribution of this species ca. 185 km N (airline distance) from the closest reported locality at Tuxtla Gutierrez, Chiapas, Mexico (Muñoz-Alonso and March-Mifsut, 2003). They also represent the first records of *E. flavitorques* along the coast of the Gulf of Mexico. We compared our material with that reported in the literature, and most of the features correspond to those described in the key provided by Smith et al. (1967) and the description in Wilson and Meyer (1985).



**Fig. 1.** Specimens of *Enulius flavitorques* deposited in the Colección de Anfibios y Reptiles de Tabasco, División Académica de Ciencias Biológicas, at the Universidad Juárez Autónoma de Tabasco (CART 0738, 0739).  © Marco A. López-Luna

**Acknowledgments.**—Collecting permits (SGPA/DGVS/03484/14) were issued by the Ministry of Environment and Natural Resources of Mexico (Secretaría de Medio Ambiente y Recursos Naturales de México) to Pierre Charruau (Centro del Cambio Global y la Sustentabilidad en el Sureste, A.C.). We thank Luis Canseco-Márquez and Antonio Muñoz-Alonso for confirming the identification of the species.

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## Family Colubridae

***Leptophis mexicanus* (Duméril, Bibron & Duméril, 1854).** MEXICO: HIDALGO: Municipio de San Felipe Orizatlán, near El Naranjal (21.19081°N, -98.58041°W; WGS 84) elev. 177 m; 27 September 2015; Gonzalo Hernández-Hernández. The specimen was found dead on the road and is deposited in the herpetological collection of the Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Hidalgo (CH CIB 4873). It represents a new municipality record, with the closest known locality ca. 32.8 km to the NE (airline distance) near the vicinity of La Reforma, Municipio de Tepehuacán de Guerrero, Hidalgo (Ramírez-Bautista et al., 2014).

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## Family Dipsadidae

***Geophis semidoliatus* (Duméril, Bibron & Duméril, 1854).** MEXICO: OAXACA: Municipio de San José Tenango, San José Tenango (18°09'09"N, 96°42'58"W; WGS 84); elev. 764 m; 13 June 2015. The specimen (MZFC 30044, Fig. 1), an adult female with a snout–vent length of 330 mm and a tail length of 32 mm, was collected crossing a street near the center of the town, ca. 270 m NE of the municipal market. Downs (1967) indicated the distribution of this species as along the eastern slopes of the neovolcanic plateau from Misantla southward to the Cordoba-Orizaba region of Veracruz, at elevations from 500 to 1,400 m. Subsequently, both Canseco-Márquez et al. (2000) and García-Vázquez et al. (2009) extended the distribution, based on a few specimens collected in Puebla. The specimen reported here represents a new record for the state of Oaxaca, as well as the southernmost record for the species, extending its distribution ca. 42.8 km SSE from the closest reported locality in the vicinity of San José Tenango, Municipio de Eloxochitlán, Tepequequiapan, Puebla (García-Vázquez et al. 2009). According to NOM-059-SEMARNAT-2010 this species is not listed in any category of risk. Using the EVS measure, however, Wilson et al (2013) placed this species at the upper end of the medium vulnerability category.



**Fig. 1.** An adult female *Geophis semidoliatus* (MZFC 30044) from Municipio de San José Tenango, Oaxaca, Mexico.

© Luis F. Vázquez-Vega

**Acknowledgments.**—Fieldwork was conducted under a collecting permit issued to Oscar Flores-Villela by the Secretaria de Medio Ambiente y Recursos Naturales (permit number SGPA/DGVS/10992/14).

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## Family Dipsadidae

***Leptodeira nigrofasciata* Günther, 1868.** MEXICO: OAXACA: Municipio Villa de Tututepec de Melchor Ocampo, Santa Cruz Tututepec (16.209603°N, -97.507447°W; WGS 84); elev. 523 m; 24 January 2016; Ana Paulina Téllez-Escalante and Jesús Manuel Cortés-Cruz. The snake (Fig. 1) was found in the morning under a sheet of metal, in a clearing within tropical deciduous forest. Photo vouchers are deposited in The University of Texas at Arlington Digital Collection (UTADC 8634–35). This specimen represents a new municipality record, and fills a gap between the populations recorded on the Pacific versant of Guerrero and Oaxaca. The locality is ca. 258.7 km SE from Acapulco, Guerrero, and 245.2 km W of Tehuantepec, Oaxaca (Duellman, 1958), and 89.5 km SE from a record from 7 mi (= 11.3 km) S Putla, Oaxaca (UTEP Herps-3557; www.vertnet.org, accessed 20 February 2016).

In a study of lineage diversification in the genus *Leptodeira*, Daza et al. (2009) examined four individuals of *L. nigrofasciata* and their results indicated two very divergent allopatric lineages of fairly ancient divergence, one from the pacific coast of Mexico and the other from Central America (northern Guatemala to north-western Costa Rica). In spite of these results and strong morphological differences (see Figs. 1, 2), these authors chose to wait until samples from El Salvador, Honduras, and Nicaragua were available before recognizing these taxa as different species. If future studies using additional samples from these areas of Central America show similar results, the name of populations from the Pacific coast of Mexico would change, as the type locality of *L. nigrofasciata* is in Nicaragua. Based on two specimens collected by Francis Sumichrast, Cope (1870) described *Leptodira mystacina* from the western region of Mexico, near the Isthmus of Tehuantepec, a taxon that later was placed in the synonymy of *L. nigrofasciata* (see Duellman, 1958).

**Acknowledgments.**—We thank Carl J. Franklin for providing the photo voucher number.



**Fig. 1.** A *Leptodeira nigrofasciata* (UTADC-8635) from Santa Cruz Tututepec, Villa de Tututepec de Melchor Ocampo, Oaxaca, Mexico. © Ana Paulina Téllez-Escalante



**Fig. 2.** A *Leptodeira nigrofasciata* from Santa Ana, vicinity of Playas del Coco, Provincia de Guanacaste, Costa Rica. Note the differences in color pattern between the northern (Fig. 1) and southern populations of this species.

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## First record of *Trimetopon pliolepis* Cope, 1894 (Reptilia: Squamata: Dipsadidae) from Nicaragua

Because of their small body size and secretive nature, little information is available on leaf litter snakes of the genus *Trimetopon* (Solórzano, 2004; Köhler, 2008; Herse and Ray, 2014; Derry et al., 2015). The genus is endemic to Lower Central America, and its six known species are restricted in distribution to Costa Rica and Panama (Savage, 2002; Köhler, 2008). The species with the broadest distribution is *T. pliolepis* (total length [TL] to 287 mm), which is known to occur from northeastern Costa Rica to southwestern Panama (Savage, 2002; Köhler, 2008).

On 31 October 2005, AAGR collected a specimen of *T. pliolepis* (MHUL 173; Fig. 1) at Reserva de la Biósfera del Sureste de Nicaragua, Reserva Biológica Indio-Maíz, Dos Bocas de Bartola, Departamento de Río San Juan, Nicaragua (10.99489°N, 84.27758°W; WGS 84); elev. 125 m. The specimen, an adult female (TL 239 mm), was found inside a fallen and abandoned arboreal termite nest that also contained annelids and centipedes. *Trimetopon pliolepis* previously has been recorded in leaf litter (Savage, 2002), under rocks and logs, and in small tunnels and subterranean burrows (Solórzano, 2004). MHUL 173 is characterized by the following: 1 large prefrontal; 1 loreal; 1 preocular; 1 postocular; 7 supralabials, the 4<sup>th</sup> and 5<sup>th</sup> in contact with orbit; 7 infralabials; nasal divided; 2 internasals; 17 rows of smooth dorsal scales; 148 ventrals; 70 subcaudals; tail 28.5% of TL; tail almost complete, with a small portion of the tip missing and slightly regenerated; cloacal scute divided; obscure general appearance with a weak pale nuchal collar broken medially by a dark middorsal stripe, and to a lesser degree by other dark dorsolateral dark stripes that continue uninterrupted along a dark brown body; venter immaculate, brownish-yellow anteriorly and slightly greener tone posteriorly; and subcaudals white.

This Nicaraguan locality lies within one of Central America's largest expanses of Tropical Wet Forest (Holdridge, 1967; Savage, 2002). The specimen represents the first record for Nicaragua and the northernmost record for the genus, with a range extension of ca. 60 km NW from its closest reported locality (Savage, 2002; Köhler, 2008). This record previously was included in HerpetoNicas (2015), based on the same photograph (erroneously credited to Gustavo Adolfo Ruiz Pérez), but because of the of the relatively low number of copies of this free limited edition publication, which only is available at the national level, herein we report this record based on the specimen.



**Fig. 1.** An adult female *Trimetopon pliolepis* from Dos Bocas de Bartola, Departamento Río San Juan, Nicaragua.

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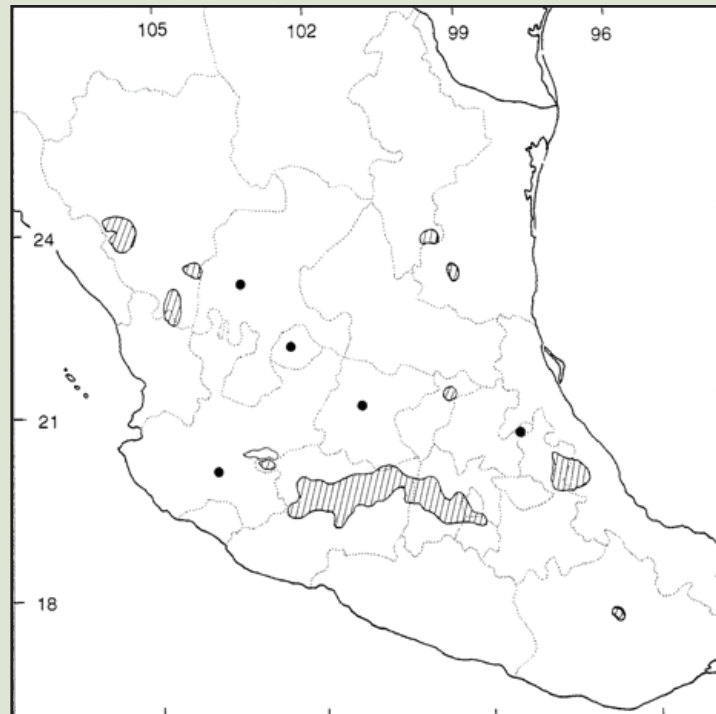
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## New records of *Thamnophis pulchrilatus* (Squamata: Natricidae) from the state of Hidalgo, Mexico

The Yellow-Throated Gartersnake, *Thamnophis pulchrilatus*, is endemic to Mexico and inhabits pine and oak forest at elevations from 1,300 and 2,900 m (Rossman et al., 1996; Wilson and Johnson, 2010). The distribution of this species is irregular, and has been reported from the states of Aguascalientes, Durango, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Morelos, Nayarit, Nuevo León, Puebla, Oaxaca, Querétaro, Tamaulipas, and Zacatecas, as well as from the Distrito Federal (Rossman et al., 1996: Fig. 1); to the south, its distribution borders the Mexican Plateau (Rossman et al., 1996). Additionally, significant distributional gaps are present throughout its range (e.g., disjunct populations in Querétaro, Puebla, and Veracruz; see Fig. 1).



**Fig. 1.** Distribution map of *Thamnophis pulchrilatus*, from Rossman et al. (1996), showing the allopatric distribution of this species in central Mexico.

*Thamnophis pulchrilatus* has been reported from southeastern Hidalgo, but the authors did not provide the exact location or the municipality (Rossman et al., 1996; Fig. 1); the location, however, falls in the Sierra Otomí Tepehua. More recently, Ramírez-Bautista et al. (2010, 2014) recorded two specimens from the south-central part of the state, from La Estanzuela, Municipio de Mineral del Chico. Additionally, Ramírez-Bautista et al. (2014), provided a photographic record of a specimen collected in the central part of the state, from Presa Los Ángeles, Municipio de Atotonilco el Grande; this locality, however, is located in Municipio de Omitlán de Juárez (Gobierno del Estado de Hidalgo, 2010). In a recent checklist of the herpetofauna of Hidalgo, however, Lemos-Espinal and Smith (2015) did not include the presence of this species in the state. Consequently, herein we provide more precise information on the distribution of *T. pulchrilatus* in Hidalgo, and provide a map with the reported localities (Fig. 2).

We include records from field trips conducted in the state in 2015, those available from the literature (Rossman et al., 1996; Ramírez-Bautista et al., 2010; 2014), records from the database of project 191908, FOMIX-CONACyT-Hgo, as well as ones from the herpetological collection at the Centro de Investigaciones Biológicas of

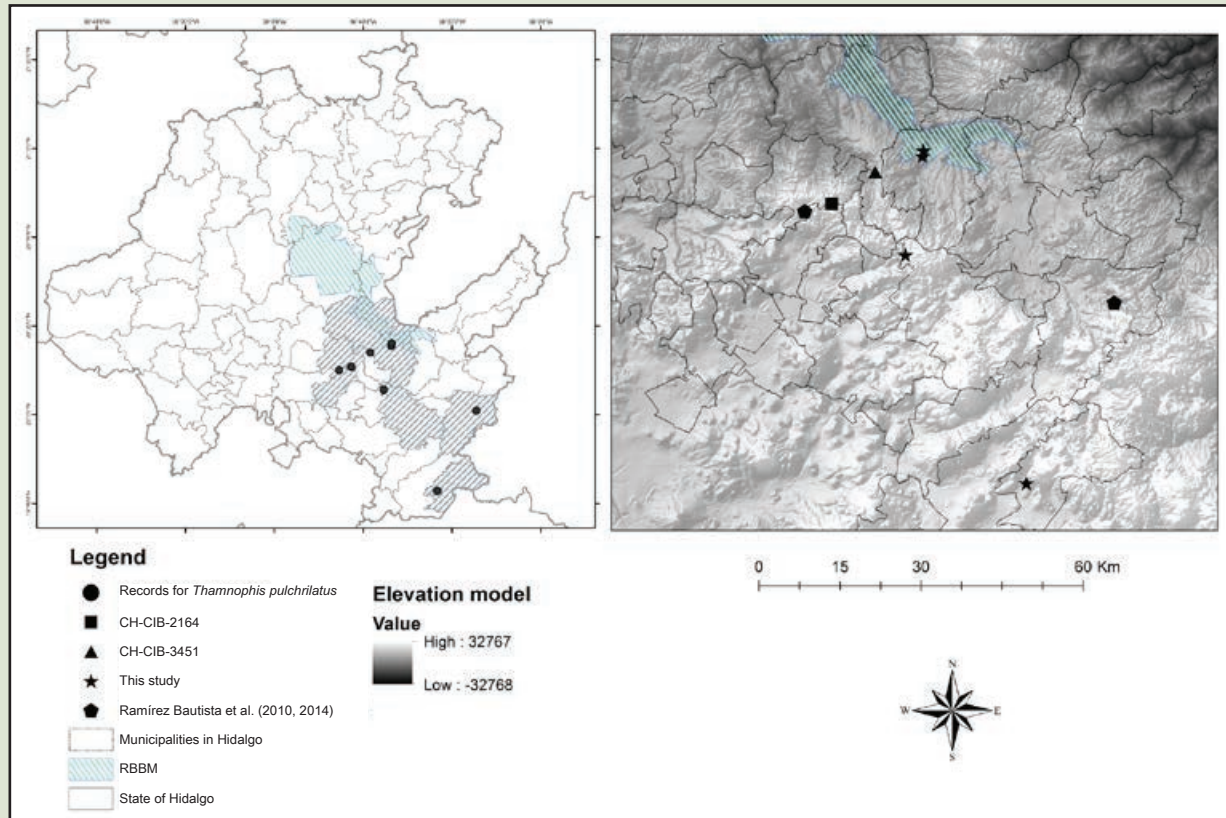
the Universidad Autónoma del Estado de Hidalgo (CH-CIB) (Table 1). We examined the taxonomic identification of all the specimens of *Thamnophis* housed in the CH-CIB collection, as well that of a specimen of *T. cyrtopsis* from Cebaditas, Municipio de Cuautepéc de Hinojosa, collected by Raciél Cruz-Elizalde (see Cruz-Elizalde, 2010; Ramírez-Bautista et al. 2010; 2014). After examining the specimen, however, we determined it to be *T. pulchrilatus*, owing to the presence of 7 supralabials (usually 8 in *T. cyrtopsis*); Uri O. García-Vázquez and J. Eduardo González-Espinoza also corroborated the identification of the specimen. Additionally, we found two more specimens of *T. pulchrilatus* (CH-CIB 2164; 3451), the first from Valle de los Enamorados, and the second from Presa Los Los Ángeles.

We identified, photographed, and immediately released all specimens observed in the field, and deposited the images in the CH-CIB photographic collection. Based on these records (fieldwork, literature, and database) we constructed a map showing the distribution of *T. pulchrilatus* in Hidalgo (Fig. 2). Because of the imprecise locality, we did not include the location of the specimen from southeastern Hidalgo shown in Rossman et al. (1996).

During our fieldwork we obtained four new municipality records for Almoloya de Juárez, Epazoyucan, Huasca de Ocampo, and Singuilucan (Table 1; Fig. 2; Fig. 3A, B, C, D respectively), including the first report of *T. pulchrilatus* from within the Reserva de la Biósfera Barranca de Metztlán (RBBM), in Municipio de Huasca de Ocampo.

**Table 1.** Records of *Thamnophis pulchrilatus* in Hidalgo. Key to abbreviations: Veg. = Vegetation type; POF = Pine-oak forest; RV = Riparian vegetation; OF = Oak forest; C = Crops; and RBBM = Reserva de la Biósfera Barranca de Metztlán. Numbers in Source column correspond to: (1) Cruz-Elizalde (2010); (2) Ramírez-Bautista et al. (2010); (3) Ramírez-Bautista et al. (2014); and (4) Rossman et al. (1996).

Area	Municipality	Locality	Geographic Coordinates	Elevation	Vegetation	Source
Sierra Otomi-Tepesua	—	—	—	—	—	4
Altiplanicie Pulquera	Almoloya de Juárez	San Antonio Alconedo	19.71398°N, -98.38869°W	2597	C	This study (photo voucher CH-CIB 55)
Valle de Tulancingo	Cuautepéc de Hinojosa	Cebaditas	20.01483°N, -98.24229°W	2386	POF	1, 2, 3 (photo voucher CH-CIB 59)
Sierra de las Navajas	Epazoyucan	Camino a La Joya	20.07142°N, -98.57891°W	2844	C-POF	This study (photo voucher CH-CIB 56)
RBBM	Huasca de Ocampo	La Cañada	20.25855°N, -98.56150°W	2044	OF	This study (photo voucher CH-CIB 57)
RBBM	Huasca de Ocampo	San Bartolo	20.26789°N, -98.55993°W	1996	OF	This study
Sierra de Pachuca	Mineral del Chico	La Estanzuela	20.16697°N, -98.75711°W	2744	POF	2, 3
Sierra de Pachuca	Mineral del Chico	Valle de los Enamorados	20.17919°N, -98.71119°W	2929	BA	CH-CIB 2164
Vicinity of Sierra de Pachuca	Omitlán de Juárez-	Presa Los Ángeles	20.23225°N, -98.64029°W	2295	RV	3, CH-CIB-3451; photo CH-CIB 60
Sierra de las Navajas	Singuilucan	El Guajolote	20.09422°N, -98.58977°W	2796	OF	This study (photo voucher CH-CIB 58)



**Fig. 2.** Distribution map of *Thamnophis pulchrilatus* in Hidalgo, Mexico, showing localities reported in this study, as well as corroborated literature records.

The elevation for *T. pulchrilatus* from the state of Hidalgo reported in this study ranges from 1,966 to 2,929 m, with the latter being the highest elevation (an increase 125 m) from that reported for this species by Rossman et al. (1996). Furthermore, we report sympatry between *T. cyrtopsis* and *T. pulchrilatus* for the first time in Hidalgo, in the town of La Cañada, Municipio de Huasca de Ocampo. Previously, sympatry between these species has been reported in the states of Durango, Guanajuato, Jalisco, Michoacán, Nayarit, Oaxaca, Querétaro, and Tamaulipas (Rossman et al., 1996).

The presence of *T. pulchrilatus* in the municipalities of Almoloya de Juárez, Epazoyucan, Huasca de Ocampo, and Singuilucan, or within the RBBM, had not been reported in previous studies (Mendoza-Quijano, 1990; Altamirano-Álvarez et al., 1999; Hernández-Pérez, 1997; Gelover et al., 2000; CONANP, 2003; Vite-Silva et al., 2010; Cruz-Elizalde et al., 2015). We could not verify the occurrence of this species in the southeastern portion of the state (Rossman et al., 1996) through our fieldwork, or with herpetological field studies conducted in nearby areas (Berriozabal-Islas, 2012; Ramírez-Bautista and Cruz-Elizalde, 2013); moreover, Ramírez-Bautista et al. (2014) did not indicate this species from this area. Nonetheless, in this study we regard the presence of *T. pulchrilatus* as valid, as shown by Rossman et al. (1996), because of the occurrence of disjunct populations of this species throughout its distribution (Fig. 1). Additionally, the type of vegetation and the elevation of some areas in the Sierra Otomí-Tepehua are similar to those of other sites in Hidalgo where this species has been recorded.

Herein, we provide new information on the distribution of *T. pulchrilatus* in Hidalgo, including the occurrence of this species in temperate forests in the south-central part of the state, in the Sierra de Pachuca and the Sierra de las Navajas, as well as in areas in the southern part of Reserva de la Biósfera Barranca de Metztitlán (RBBM).



**Fig. 3.** Photographs of *Thamnophis pulchrrilatus* observed in Hidalgo: (A) individual from Almoloya de Juárez (photo voucher CH-CIB 55); (B) individual from Epazoyucan (photo voucher CH-CIB 56); (C) individual from Huasca de Ocampo (photo voucher CH-CIB 57); (D) individual from Siquilucan (photo voucher CH-CIB 58); (E) individual from Cuauhtec de Hinojosa (*In* Ramírez-Bautista et al., 2010; CH-CIB 59); and (F) individual from Omitlán de Juárez (CH-CIB 3451; photo voucher CH-CIB 60).

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### Family Viperidae

***Crotalus campbelli* Bryson Jr, Linkem, Dorcas, Lathrop, Jones, Alvarado-Díaz, Grünwald, and Murphy, 2014.** MEXICO: JALISCO: Municipio de San Sebastián del Oeste, Cerro de la Bufa (20°44'03.11"N, -104°49'38.96"W); elev. 2,515 m; 16 September 2014; Ubaldo Sebastián Flores-Guerrero. Another observation was made at Cerro de la Bufa, near La Antena (20°43'51.25"N, -104°49'34.7"W); elev. 2,500 m; 19 September 2015; Janin Sujey Sánchez-González. The vegetation adjacent to Cerro de la Bufa is dominated by pines (*Pinus* sp.), oaks (*Quercus* sp.), and patches of cloud forest. Both individuals were photographed, and photo vouchers are deposited at the University of Texas at El Paso Biodiversity Digital Collection. The first animal (UTEP G-2016.11) was observed on a rocky substrate (Fig. 1A), and the second (UTEP G-2016.12) in leaf litter in pine-oak forest, dominated by oaks (Fig. 1B).

Bryson et al. (2014) described Campbell's Dusky Rattlesnake, *Crotalus campbelli*, from the far western regions of the Trans-Mexican Volcanic Belt, from far western Jalisco and the Sierra de Manantlán in southern Jalisco/northwestern Colima. Subsequently, Luja and Grünwald (2015) reported this species from Sierra San Juan in Nayarit. Our observations in Jalisco are the first records of *C. campbelli* in the municipality of San Sebastián del Oeste (Fig. 2), and extend the distribution of this species ca. 44 km NNE (by air) from the type locality (Sierra de Cuale, 9 km N El Teosinte, Municipio de Talpa de Allende), and ca. 15.25 km NNW (by air) from the nearest locality at Lago de Juanacatlán, Sierra de Mascota (Bryson et al., 2014).

The highest elevations for *C. campbelli* have been reported as 2,009 m (Lago de Juacanatlán, Jalisco; Bryson et al., 2014), and 2,010 m (Sierra San Juan, Nayarit; Luja and Grünwald, 2015). Our observations (2,515 and 2,500 m, respectively), therefore, represent the highest known elevations for this species.



**Fig. 1.** Individuals of *Crotalus campbelli* from Cerro de La Bufa, San Sebastian del Oeste, Jalisco. (A) UTEP G-2016.11, photographed 16 September 2014; and (B) UTEP G-2016.12, photographed 19 September 2015.

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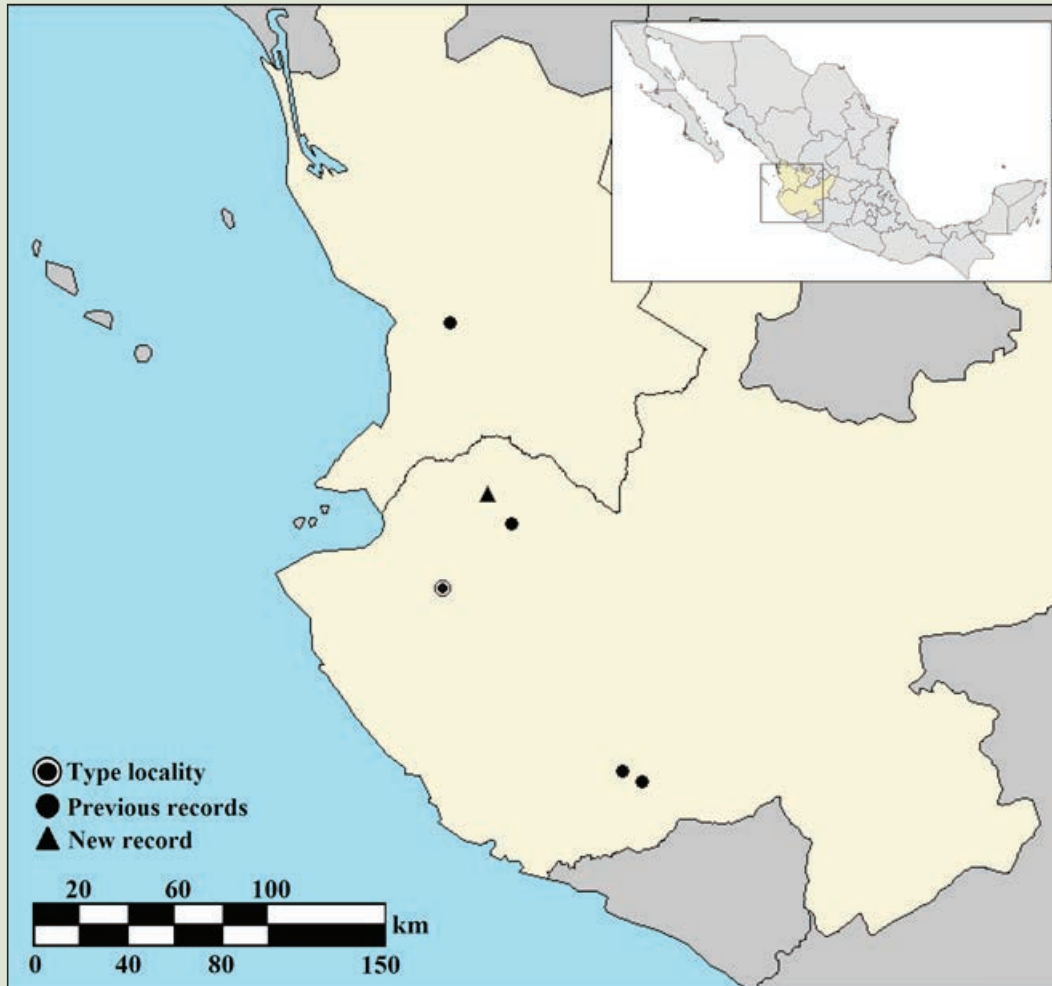


Fig. 2. Map indicating the known localities for *Crotalus campbelli*.

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## Family Viperidae

***Crotalus intermedius* (Troschel, 1865).** MEXICO: HIDALGO: Municipio de Singuilucan, Ejido Sierra de las Navajas (20.0885°N, -98.5556°W; WGS 84); elev. 3,134 m; 11 October 2014. The specimen (CH-CIB 4553) was found by a local resident and donated to the Centro de Investigaciones Biológicas, where it later died. Another individual (a male) was found near the same locality (20.0850°N, -98.571°W; WGS 84); elev. 2,913 m; 19 June 2015; Cristian Raúl Olvera-Olvera, photo voucher (CH-CIB 37; Fig 1.). Subsequently, we found another individual (a female) ca. 1.7 km SE from the first record (20.0809°N, -98.5412°W; WGS 84); elev. 3,130 m; 27 February 2016; Cristian Raúl Olvera-Olvera; photo voucher (CH-CIB 61; Fig 1). The specimen (CH-CIB 4553) and photo vouchers are deposited in the herpetological collection and in the photographic collection, respectively, of the Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Hidalgo. These records represent a new municipality for the species, with the closest known published locality ca. 15.7 km W (airline distance) in the vicinity of Azoyatla, Municipio de Mineral de la Reforma (Fernández-Badillo et al., 2013). The elevational distribution also increases 114 m from the highest reported record near Ixtlán de Juárez, Oaxaca, at 3,020 m (McCranie, 1991). Previously, Campbell and Lamar (2004) reported *C. intermedius* to be sympatric with two other species of montane rattlesnakes, *C. ravus* and *C. triseriatus*. Herein we report, for the first time, sympatry between *C. intermedius* and *C. aquilus*.

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**Fig 1.** *Crotalus intermedius* (A: CH-CIB 4553; B: CH-CIB 37; C: CH-CIB 61) from Ejido Sierra de las Navajas, Municipio de Singuilucan, Hidalgo, Mexico. © Leonardo Fernández Badillo (A) and Cristián Raúl Olvera-Olvera (B, C).

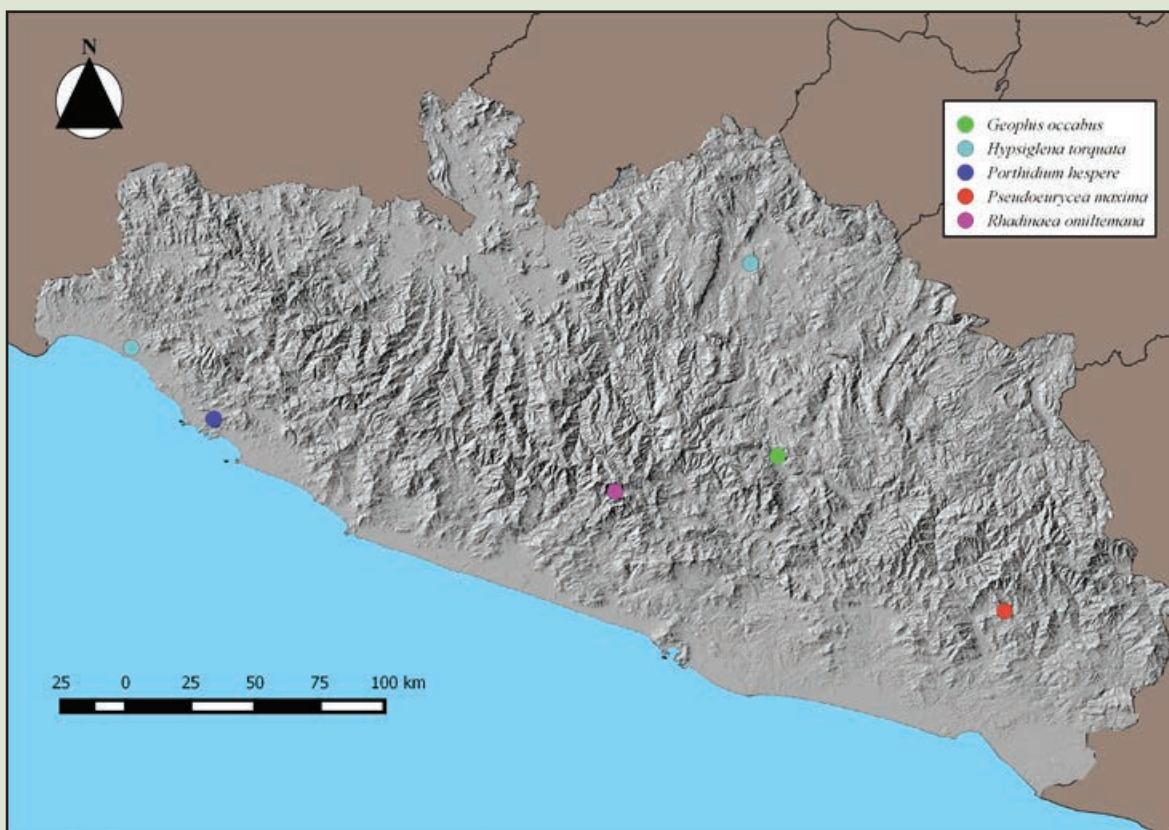
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## Notable distributional records of amphibians and reptiles from Guerrero, Mexico

Although Guerrero contains one of the richest herpetofaunas of any state in Mexico, it remains one of the least studied. Pérez-Ramos et al. (2000) provided the last review of the herpetofauna of the state, and since that time several new species have been described, new records have been reported, and other updates are pending (R. Palacios-Aguilar and O. Flores-Villela, unpublished). After an exhaustive examination of specimens collected by students and teachers from the Universidad Autónoma de Guerrero during the course “Biología de Campo” from 2000 to 2015, herein we report new distributional records for five species (four reptiles, one amphibian) in the state, including a new state record (see Fig. 1). The symbolic codes for museum collections below follow Sabaj Pérez (2014).



**Fig. 1.** Map showing the location of new records from the state of Guerrero, Mexico.

**Amphibia: Caudata**  
**Family Plethodontidae**

***Isthmura maxima* (Parra-Olea, García-París, Papenfuss, and Wake, 2005).** Previously, *Isthmura maxima* was recorded in Oaxaca, Mexico, from several localities south and northeast of Putla de Guerrero, and from 15.9 km N of San Gabriel Mixtepec, at elevations from 750 to 1,080 m (Delia et al., 2008); more recently, García-Vázquez and Durán-Fuentes (2012) reported finding this species in the state of Guerrero, at Ejido Tres Marías, Municipio de Malinaltepec.

Here we report two adult specimens of *I. maxima* (CNAR 31001–02) collected at San José Vista Hermosa, Municipio de Iliatenco, Guerrero (16.990636°N, -98.6802730348°W; elev. 1,030 m) by Elizabeth Beltrán-Sánchez. These specimens represent municipality records, and a range extension of ca. 15.2 km S from the closest known locality at Ejido Tres Marías (17.126583°N, 98.695111°W; elev. 2,331 m), Municipio de Malinaltepec, Guerrero (García-Vázquez and Durán-Fuentes, 2012). One specimen (CNAR-31001) was found dead and partially consumed by ants, and lacked the tail and a considerable portion of the hind legs.

**Reptilia: Squamata (snakes)**  
**Family Dipsadidae**

***Geophis occabus* Pavón-Vázquez, García-Vázquez, Blancas-Hernández, and Nieto-Montes de Oca, 2011.** This recently described species was known only from the vicinity of the type locality at El Molote, Municipio de Atoyac de Álvarez, Guerrero (Pavón-Vázquez et al., 2011). On 27 August 2008 a juvenile *Geophis occabus* (MZFC 30005) was found under a rock at Colonia Lomas de Ocotepec, Municipio de Chilpancingo de los Bravo (17.5503289358°N, -99.5008360418°W) by Gustavo Cuevas-Cerón. This specimen extends the geographic range ca. 74.8 km [airline] NE from the type locality (Pavón-Vázquez et al., 2011).

The presence of *G. occabus* in the vicinity of the city of Chilpancingo supports the hypothesis provided in the species' description that the specimen reported as *G. sieboldi* from Amula (Almolonga) by Downs (1967) actually might represent this species. Additional work is necessary to delimit the members of the *G. sieboldi* group, in order to determine the ecological and biogeographic distribution of the various species.

***Hypsiglena torquata* (Günther, 1860).** The distribution of *Hypsiglena torquata* extends from Sinaloa southward to Morelos and Guerrero, Mexico (Mulcahy et al., 2014). In Guerrero, this species has been reported from the Depresión del Balsas region (Tanner, 1944; Taylor, 1938), and recently Mulcahy et al. (2014) indicated its presence along the Pacific coast, but did not provide information for any specimens from the state. Here we report two additional specimens of *H. torquata* from Guerrero. One is from Xonacotla, Municipio de Cocula (18.2469586226°N, -99.597784°W; elev. 814 m) collected in October of 2000 (MZFC-30004). This specimen represents a municipality record, and extends the previously known distribution ca. 36.0 km SW from the closest locality at 12 mi (= 19.3 km) S of Puente de Ixtla, Morelos (Taylor, 1938). Other old records from the state consist of two specimens from near El Naranjo (Tanner, 1944), located about 135.8 km to the W of the specimen reported herein. Also, while examining museum specimens we found an adult male (CNAR-24449, Fig. 2) collected on 10 June 1980 by L. Landry on Hwy [sic] 200, ½ km W of La Unión cutoff (17.942463°N, -101.837124°W; elev. 56 m), which represents the first verifiable record of this species on the Pacific coast of Guerrero, and extends the range ca. 112.2 km SW from El Naranjo, Guerrero, and ca. 134.9 km SE from Apatzingán, Michoacán (Tanner, 1944).

***Rhadinaea omiltemana* (Günther, 1894).** *Rhadinaea omiltemana* is known only from pine-oak forest in the Sierra Madre del Sur of central Guerrero, from Omiltemi and the vicinity of Chilpancingo, at elevations from 2,226 to 2,439 m (Myers, 1974). While examining specimens from El Tambor, Municipio de Coyuca de Benítez (17.422002°N, -100.0889°W; elev. 2,200 m) we found a representative of this species (MZFC-30009); except for the vegetation type consisting of pine-oak forest, however, no other data on this individual were available. This specimen

represents a new municipality record and a range extension of 34.3 km [airline] S from the nearest recorded locality at 18 rd. mi. (= 29.0 km) W Asoleadero (Myers, 1974). Additionally, while checking other museum databases ([www.vertnet.org](http://www.vertnet.org)) we found the following three unpublished records of *R. omiltemana*: San Miguel Totolapan, 13.8 mi NNE El Paraíso, Sierra Madre del Sur, elev. 2,312 m (CM-89611); 12.9 km SW Puerto del Gallo, elev. 1,910 m (KU-182687); and 14.1–14.4 km SW Puerto del Gallo (KU-182688). Based on digital photographs provided by the collection managers, however, Uri O. García-Vázquez examined the last two records and concluded that they did not represent this species.



Fig. 2. A male specimen of *Hypsiglena torquata* (CNAR 24449) from near La Unión, Guerrero, Mexico.

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## Family Viperidae

***Porthidium hespere* (Campbell, 1976).** *Porthidium hespere* has been recorded from very few localities on the Pacific versant of Mexico, ranging from 19 km NE Tecomán, Municipio de Ixtlahuacán, Colima (type locality) to some localities in tropical deciduous forest in coastal plain of Michoacán (Campbell and Lamar, 2004; Bryson et al., 2008). On 27 June 2015 an adult male of this species (MZFC-30006, Fig. 3) was collected at night at Mata de Sandía, Municipio de Zihuatanejo de Azueta (17.6853442°N, -101.53932°W; elev. 255 m) by Elizabeth Beltrán-Sánchez. This specimen represents the first record for the state of Guerrero, and extends the known range of *P. hespere* ca. 121.5 km SE from the closest locality at Rancho La Cuesta del Novillo, Arteaga, Michoacán (Mendoza-Cárdenas et al., 2007).



**Fig. 3.** An adult male *Porthidium hespere* (MZFC 30006) from Mata de Sandía, Municipio de Zihuatanejo de Azueta, Guerrero, Mexico. © Rufino Santos-Bibiano

**Acknowledgments.**—We thank Oscar Flores-Villela and Victor Hugo Reynoso for their help in accessing the collections under their charges (MZFC and CNAR, respectively), Edmundo Pérez-Ramos and Angélica Domínguez for their help and consultation with accessing specimens at MZFC, and Alejandro Calzada-Arciniega for accessing specimens at CNAR and for comments on a preliminary draft of this manuscript. We also thank Rafe Brown, Richard Glor, and Luke Welton from Kansas University Herpetological Collection for kindly providing photographs of *Rhadinaea omiltemana*, and Uri García for confirming the specimen's identification. Finally, we are grateful to Carlos Pavón-Vázquez for verifying the identification of the specimen of *Geophis occabus*, Daniel Noriega-Hidalgo for constructing the map, and Louis Porras for helpful comments on the final version of the manuscript. Fieldwork was conducted under SEMARNAT collection permit (FAUT-0015) issued to Oscar Flores-Villela.

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**First records for Cozumel Island, Quintana Roo, Mexico:  
*Eleutherodactylus planirostris* (Anura: Eleutherodactylidae),  
*Trachycephalus typhonius* (Anura: Hylidae), and  
*Indotyphlops braminus* (Squamata: Typhlopidae)**

Cozumel is an oceanic island of coralline origin located 17.5 km off the Yucatan Peninsula in the Caribbean Sea (Romero-Nájera et al., 2007). The island is the largest in the Mexican Caribbean Sea, and is characterized by a humid tropical climate, with a mean annual temperature of 25.5°C and mean annual rainfall of 1,505 mm (Cuarón, 2009). As of the year 2000 natural vegetation covered roughly 90% of the island, which mainly was comprised of semi-evergreen tropical forest (Cuarón, 2009).

Cozumel contains more endemic taxa than any other island in Mexico, and is noteworthy for its vertebrate endemism (28 taxa). One of the endemic taxa is the Cozumel Whiptail Lizard, *Aspidoscelis cozumela*, whose morphological and karyological differentiation from the closely-related mainland *A. maslini* suggests their respective specific status (Manríquez-Morán et al., 2014). Unfortunately, in the last few decades several invasive animal species have been introduced on the island, including mice, rats, and feral dogs and cats (Cuarón, 2009). Among the invasive species are the reptiles *Anolis (Norops) sagrei*, *Boa imperator*, *Hemidactylus frenatus*, and *H. turcius* (López-González and González-Romero, 1997; Cuarón, 2009; Farr, 2011; Vázquez-Domínguez et al., 2012).

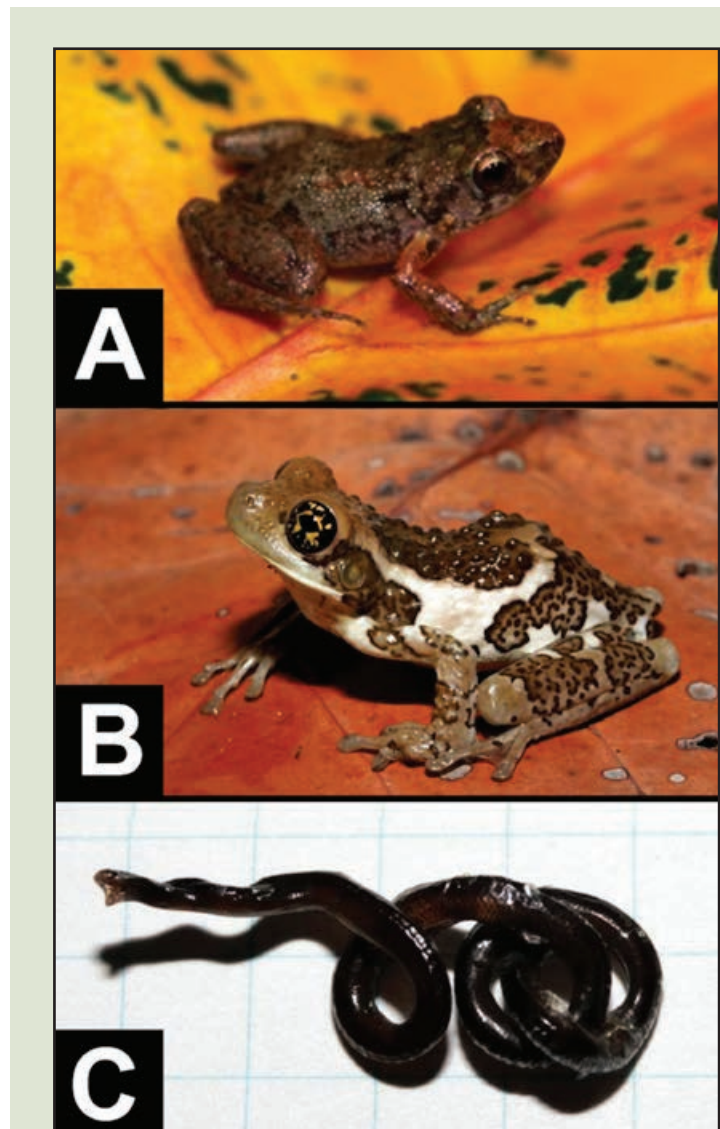
During fieldwork conducted in Cozumel from 12 to 19 December 2015, we collected three specimens of the chirping frog *Eleutherodactylus planirostris*, two of the treefrog *Trachycephalus typhonius*, and one of the blindsnake *Indotyphlops braminus*. These constitute the first published records of these non-native species from the island. The specimens were deposited in the herpetological collection of the Museo de Zoología “Alfonso L. Herrera,” Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico (MZFC).

We collected a juvenile of *E. planirostris* (MZFC 30039; Fig 1A) in chit palm forest on the east coast of the island (20.40401N, 86.85809W; WGS 84; elev. 4 m) on 13 December 2015 at ca. 2100 h, and two adults (MZFC

30040–30041) in tropical forest on the west coast of the island near a harbor just north of the town of San Miguel (20.52878°N, 86.93867°W, WGS 84; elev. 7 m) on 15 December 2015 at ca. 2200 h. Both sites had a rocky substrate with abundant crevices, and the specimens were found active on the leaf litter. The Greenhouse Frog, *E. planirostris*, is native to Cuba, the Bahamas, and the Cayman Islands, but it has been introduced to Grenada, Guam, Honduras, Jamaica, Mexico, the Miskito Cays of Nicaragua, the Turks and Caicos Islands, Panama, and the United States, including Hawaii (see Cedeño-Vázquez et al., 2014, and references therein). The records of *E. planirostris* closest to ours are those from Playa del Carmen, Quintana Roo, Mexico (Cedeño-Vázquez et al., 2014), ca. 17.8 km (straight line distance) from the town of San Miguel. This species probably was introduced to Cozumel from Playa del Carmen, since ferries from there are the main entryway into the island. Although we only collected three specimens, we observed numerous individuals of this species moving about in leaf litter at the collecting sites. Thus, reproducing populations of *E. planirostris* apparently are present on the eastern and western coasts of Cozumel.

We found two specimens (MZFC 30045–30046) of *Trachycephalus typhonius* on branches ca. 2 m above the ground in semi-evergreen tropical forest, along a dirt road in Punta Norte, ca. 6 km N of the town of San Miguel (20.55411°N, 86.91338°W; WGS 84; elev. 4 m), on 17 December 2015 at ca. 2350 h. One of the specimens was a juvenile and the other a sub-adult, both of undetermined sex. The Milky Treefrog, *T. typhonius*, is common and widespread in the Yucatan Peninsula, including Quintana Roo (Lee, 1996), but published records for Cozumel are absent. Jorge Armín Escalante Pasos uploaded an observation of this species for Cozumel on 7 July 2014 in the iNaturalist online project, and Juan Carlos García Morales did the same on 10 January 2015. This work, however, represents the first published record of this species from the island. Given that the area has been studied comprehensively in the past and *T. typhonius* has not been reported in previous publications, this species likely was introduced to Cozumel in recent years.

We found an adult specimen of *Indotyphlops braminus* (MZFC 30042; Fig. 1B) dead on a sidewalk where apparently it had been exposed to sunlight for several hours in the town of San Miguel, at the intersection of “Avenida 4 Norte” and “Avenida 20 Norte” (20.509967°N, 86.9451°W, WGS 84; elev. 7 m), on 18 December 2015 at ca. 1600 h. The snake probably came from a garden in one of the surrounding houses, since plant nursery trade is the main path of dispersal for this species (Díaz and Cádiz, 2014). The Brahminy Blind Snake, *I. braminus*, is native to Southeast Asia, but due to human-aided dispersal it is now the most widespread snake species in the world (Díaz and Cádiz, 2014). This species was reported from Cancún, Quintana Roo, Mexico, ca. 75 km (straight line distance) from the town of San Miguel, by Christian Amador García on the “Weeds Across Borders 2012” meeting, and the observation was added to the iNaturalist



**Fig. 1.** Species reported herein for Cozumel, Quintana Roo, Mexico: (A) *Eleutherodactylus planirostris* (MZFC 30039); (B) *Trachycephalus typhonius* (MZFC 30045); and (C) *Indotyphlops braminus* (MZFC 30042). © Brittney A. White



online project on 15 May 2015. Even though we only found one specimen, this parthenogenetic species is capable of reproducing and establishing a new population on the basis of a single individual (Díaz and Cádiz, 2014).

The new records provided here for the extensively studied Cozumel highlight the failure of ongoing control measures in preventing the introduction of exotic species, even though their presence has been recognized as a major threat to the native fauna (Cuarón, 2009). Other detected threats are habitat fragmentation, potential introgression in endemic taxa due to the introduction of mainland congeners, introduction of foreign diseases, collecting of individuals for the pet trade, and hunting (Cuarón, 2009). More rigorous regulations over the movement of people and goods in and out of the island might be necessary in order to protect Cozumel's biological wealth.

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# MISCELLANEOUS NOTES

## A new Mexican locality for the endangered salamander *Nyctanolis pernix* (Caudata: Plethodontidae)

The monotypic salamander genus *Nyctanolis* Elias and Wake, 1983 is known from only a few localities in western Guatemala and one in extreme southeastern Chiapas, Mexico. *Nyctanolis pernix* is one of the most sought after amphibian species by many herpetologists working or visiting the area, owing to its secretive habits and apparent rarity. Since its description from a type series originating at Finca Chiblac, Departamento de Huehuetenango, Guatemala and a single specimen from Lagunas de Montebello, Chiapas, Mexico (Elias and Wake 1983), this species has been reported only from two other localities in Guatemala (AmphibiaWeb, 2016). Here we report a second locality in Chiapas, Mexico, representing the fifth record for this species.

During a herpetofaunal survey in the Sierra Tojolabal (Grünwald et al., *In Press*), we entered a small cave while searching for frogs of the *Craugastor alfredi* complex. In addition to finding several of these frogs, we discovered two specimens of *N. pernix* in and around small crevices in the cave. One was active early in the afternoon (ca. 1400 h) crawling toward a small hole in the cave, and the other was found inactive (ca. 2200 h) coiled in a small cavity in the cave wall. Although we failed to record temperature and relative humidity data, the humidity was high and we estimate the temperature at ca. 12–15°C. The cave is located near the town of Leyva Velázquez, Municipio de Las Margaritas, Chiapas, (16.463240°, -91.792450°; datum WGS 84; elev. 2,145 m) in a humid pine forest–montane cloud forest ecotone. This location lies north-northwest of the only previous record from Mexico, in a cave along a stream draining Laguna Tzisco, Lagunas de Montebello, Chiapas (Elias and Wake, 1983), in an area separated from the highlands surrounding Lagunas de Montebello by a dry valley with a maximum elevation of 1,200 m. This locality constitutes a new municipality record, extends the known distributional range 42 km NNW of the previous northernmost known locality, and extends the elevational distribution 535 m from the previously reported maximum (1,610 m; Parra-Olea 2008).

The local people were aware of this salamander, but never had seen one inside a cave; however, they do not carry flashlights or regularly enter caves. They also mentioned finding this species under logs, while collecting firewood during the rainy season.

The three specimens now known from Mexico (USNM [United States National Museum] 206925, and MZFC [Museo Zoología Facultad de Ciencias, Universidad Nacional Autónoma de México] 29271–72) were found in caves in humid pine forest (Fig. 1), whereas the Guatemalan specimens were collected in cloud forest, under moss and bark on vertical tree trunks (Fig. 2) and under fallen logs.

We noted coloration and proportional size differences in the last two Mexican specimens, when compared to those from Guatemala. Red or



**Fig. 1.** A male *Nyctanolis pernix* (MZFC 29272) as found in a cave near Leyva Velázquez, Municipio de Las Margaritas, Chiapas, Mexico. © César Barrio-Amorós

orange spots with faded edges are present on the anterior part of the body and head of the Guatemalan salamanders (Fig. 2), but the spots are better delimited in the Mexican specimens and range from pale yellow on the tail and posterior part of the body to dark yellow on the anterior part of the body and head (Figs. 1, 3). The proportional size of the eyes also appeared to differ (Table 1), but could not be measured readily. An exercise in measuring the eye diameter length (EDL) and the head length (HL) on photos online revealed a larger proportion in the eye size of the Guatemalan specimens (EDL 28.28– 37.9% of the HL, vs. 17.6–18.68% in the specimens reported herein; Table 1). These external differences and the occurrence of this species in isolated mountain ranges should be examined in more detail through molecular and detailed morphological analyses, to determine the possibility of specific differentiation.



**Fig. 2.** A *Nyctanolis pernix* photographed *in situ* in Municipalidad Barillas, Departamento de Huehuetenango, Guatemala, elev. 1,400 m. © Timothy A. Herman



**Fig. 3.** A female *Nyctanolis pernix* (MZFC 29271) found in a cave near Leyva Velázquez, Municipio de Las Margaritas, Chiapas, Mexico. © Christoph I. Grünwald

**Table 1.** Measurements of the two specimens considered herein. SVL = snout–vent length; TL = tail length; HL = head length; HW = head width; EDL = eye diameter length (horizontal); SL = snout length (measured from anterior edge of eye to tip of snout); HLL = hindlimb length; FLL = forelimb length; MT = number of maxillary teeth; and VT = number of vomerine teeth. All measurements in mm, except EDL/HL (%).

	SVL	TL	HL	HW	EDL	EDL/HL	SL	HLL	FLL	MT	VT
MZFC 29271 (female)	58.97	96.16	14.26	10.70	2.51	16.6%	3.18	22.70	19.63	120	32
MZFC 29272 (male)	58.81	64.31	16.00	10.62	2.99	18.7%	2.47	23.31	20.46	116	38

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## ***Urotheca guentheri* in Darién, Panama, at the northern extreme of the Chocó Biogeographic Region**

The genus *Urotheca* consists of eight Neotropical snake species characterized by a long and thick fragile tail, and a dark brown dorsum with or without lateral white stripes or white spots on the head and nuchal region (Myers, 1974). The systematic status of *Urotheca* has been controversial. Previously, species in *Urotheca* were included in *Rhadinaea* (Dunn, 1944) and clustered as the “*lateristriga*” group (Myers, 1974). Savage and Crother (1989) revived the genus *Urotheca* for the “*lateristriga*” group of *Rhadinaea* and for the species in *Pliocercus*, based on hemipenial and caudal similarities between both sets of species. Myers and Cadle (1994) then suggested that *Pliocercus* and *Urotheca* are monophyletic sister groups, each characterized by color pattern synapomorphies, including *Micrurus*-like rings in *Pliocercus* and white stripes in *Urotheca*. More recently, Sheehy (2012) suggested that *Pliocercus* might need to be synonymized with *Urotheca*, but that more taxon sampling was necessary to verify this conclusion.

The genus *Urotheca* is distributed in Central and South America, with some species occurring only in South America (*U. dumerillii*, *U. lateristriga*, and *U. multilineata*), others only in Central America (*U. guentheri*, *U. myersi*, and *U. pachyura*), and some in both regions (*U. decipiens* and *U. fulviceps*) (Myers, 1974; Savage, 2002; Köhler, 2008). Among the Central American species, the distribution of *U. guentheri* extends from northeastern Honduras to central Panama (Myers, 1974; Köhler, 2008). Interestingly, hemipenial and morphological evidence suggests a strong systematic relationship between *U. guentheri* and the strictly South American congeners, rather than those found only in Central America (Myers, 1974).

The color pattern of *U. guentheri* has been described as follows: two lateral white stripes on both sides of the body; a pair of white ocelli on the head, specifically along the outer edge of each parietal scale immediately behind each upper postocular; an ocellus on each side of the neck that in some cases is an enlarged terminus of the dorsolateral white stripes; a white ocellus or white line on the nape region; and a red-orange venter (Myers, 1974). Here I describe a specimen of *U. guentheri* collected in the Chocó Biogeographic Region, in close proximity to congeners occurring in South America. This record adds distributional information to this species, and augments our knowledge of this controversial genus.

The snake was found on 20 August 2014 at ca. 1050 h, in Premontane Wet Forest at Cerro Pirre, Serranía de Pirre, Parque Nacional Darién (PND), Provincia de Darién, Panama (7.99722°N, -77.71277°W; WGS 84); elev. ca. 615 m. The individual was hiding beneath a root along the edge of a slope on a trail to the top of Cerro Pirre; the ambient temperature was 23°C, and the relative humidity 75%. The specimen was photographed, then euthanized and fixed in a 10% formalin solution and later photographed at the Museo de Vertebrados de la Universidad de Panamá (MVUP). I based my identification of the species on Myers (1974) and Köhler (2008). Unfortunately, the specimen and other herpetofaunal material from the Serranía de Pirre, along with personal items, were stolen before the specimens could be deposited in the MVUP collection. The data collected from the *U. guentheri* is as follows: a young male measuring 220.77 mm in snout–vent length (SVL), 46.41 mm in tail length (T), and 367.18 mm in total length (TL), corresponding to a TL/SVL ratio of 0.66 and a T/TL proportion of 0.39; dorsal scale rows 17-17-17, ventrals 140, and paired subcaudals 102; the head scutellation (view from left side) consists of an enlarged supraocular, 1 preocular, and 1 subpreocular fused between corners of 3<sup>rd</sup> and 4<sup>th</sup> supralabials on the left side (Fig. 1D) and 1 preocular on the right side, 2 postoculars, 1 loreal (Fig. 1D), 1 frontal, 2 prefrontals (Fig. 1C), 2 internasals, pre- and postnasal divided, 1 enlarged rostral, 2 parietals (Fig. 1C), temporal formula 1–2+1 (Fig. 1D), labials 9 on the right side and 8 on the left, and 8 infralabials covered with white on their lower surface resemble a white infralabial stripe on each side (Fig. 1D); coloration (in life)—dorsum dark brown with 2 stripes, a lower white stripe on 1<sup>st</sup> and 2<sup>nd</sup> scale rows, and an upper pinkish-beige stripe on 5<sup>th</sup> and 6<sup>th</sup> scale rows (Fig. 1A, D); in the neck region, the lower stripe fuses with the infralabials (Fig. 1D), and the upper stripe starts posterior to post-temporals (Fig. 1D); paravertebral scales rows olive green, forming a paravertebral stripe of this color (Fig. 1A, C); surface area between lower and upper lateral stripes darker than that between upper lateral stripes (Fig. 1A, D); 3 white ocelli present, one on the lower end of each parietal scale and the other covering 3<sup>rd</sup> and 4<sup>th</sup> paravertebral scales (Fig. 1C, D); and venter reddish orange in life, but turned paler in preservative (Fig. 1B).

In Panama, *U. guentheri* has been reported from the western and central parts of the country (Myers, 1974; Pérez Santos, 1999; Lotzkat et al., 2010; Sosa Bartuano et al., 2012). This individual represents a range extension of 228.3 km to the SE from Cerro Azul in Parque Nacional Chagres, in central Panama (Sosa Bartuano et al., 2012) to Cerro Pirre, PND, in eastern Panama. It also represents the southeasternmost record for the species, as well as the closest locality to any of its strictly South American congeners. Myers (1974) developed an intrageneric morphological series for his “*lateristriga* group” (in *Rhadinaea*), based on hemipenial, dentary, and morphological characters. He considered the presence of the white stripes as a primitive character, and the absence of stripes as a derived character of secondary loss in the evolutionary course of the group. The species were clustered in the ancient series (*U. lateristriga*–*U. guentheri*, *U. multilineata*), the derived series (*U. decipiens*–*U. pachyura*–*U. fulviceps*–*U. myersi*), and with *U. dumerillii* as a separate clade (Myers, 1974). Furthermore, this specimen represents the first time that *U. guentheri* has been recorded in the Chocó Biogeographic Region, an area where *U. lateristriga*, morphologically the most similar species to *U. guentheri*, also occurs (Myers, 1974). In the Chocó Biogeographic Region, the Serranía de Pirre extends from Panama to Colombia and connects with low elevation hills of the Serranía de Los Saltos, which in turn connect with the Serranía del Baudó along the Pacific Chocoan region (Haffer, 1970). The Serranía de Los Saltos and Serranía del Baudó are in the Colombian department of Chocó, where *U. lateristriga* has been

recorded (Taylor-Rengifo and Rentería-Moreno, 2011); this Colombian department borders the Panamanian province of Darién. Thus, this record narrows the historic biogeographical gap in the distribution of *U. guentheri* and *U. lateristriga*, and extends the distribution of *U. guentheri* throughout lower Central America.



**Fig. 1.** *Aurotheca guentheri* from Cerro Pirre, Serranía de Pirre, Darién, Panamá. (A) dorsal view; (B) ventral view of preserved specimen; (C) dorsal view of the head; and (D) lateral view of left side of the head. © Luis Elizondo

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