Amphibia: Anura

*Craugastor hobartsmithi* (Taylor, 1936). Reproductive behavior. *Craugastor hobartsmithi* is a small frog (snout–vent length to 32 mm) that can be identified by its sometimes slightly defined paratoid glands, a brown dorsum, dark spots on the body and dark bars on the lips, a triangular patch between the eyes, and a yellowish-white venter (Alvarado-Díaz and Huacuz-Elias, 1996). This species is endemic to Mexico, and is distributed along the southwestern portion of the Central Plateau in Nayarit, Jalisco, Michoacán, and the state of Mexico, as well as along the coasts of Nayarit and Jalisco. This nocturnal, terrestrial, and insectivorous species is found in tropical deciduous forest. Reproduction is by means of eggs deposited on the ground, and there is no larval stage (Alvarado-Díaz and Huacuz-Elias, 1996).

On 20 July 2011 at 2218 h, while conducting a herpetofaunal survey we found a pair of *C. hobartsmithi* in amplexus (Fig. 1) in tropical deciduous forest in the town of Puerta de Hierro, Municipio de Coahuayana, Michoacán, Mexico. This event took place on the forest floor on a layer of leaf litter (18°40'3.10"N, 103°38'24.9"W; WGS 84); elev. 533 m; air temperature 29°C; relative humidity 97%. Rain had fallen moments before the sighting, so the ground was wet. After taking photographs, we left the frogs unmolested. To our best knowledge, these are the first photographs showing amplexus in *C. hobartsmithi*.

Fig. 1. A pair of *Craugastor hobartsmithi* found in amplexus at Puerta de Hierro, Municipio de Coahuayana, Michoacán, Mexico. © Luis Eduardo Bucio Jiménez

Acknowledgments.— We thank the Coordinación de Investigación Científica of the Universidad Michoacana de San Nicolás de Hidalgo for partially funding this project, Oscar Medina-Aguilar, Christian Jesús Dueñas-León, José Gil-Paz, and Elliot Saul Ferreyra-Porras for support in the field, and the community of Coahuayana for providing facilities for our fieldwork, which was conducted under collecting permit number DGVS/FAUT-0113.

**Literature Cited**

**Luis Eduardo Bucio-Jiménez** and **Javier Alvarado-Díaz**

**San Felipe #375, Col. Miguel Hidalgo, 14250, Delegación Tlalpan, Ciudad de México, Mexico.**

E-mail: lebj26@gmail.com

**Instituto de Investigaciones sobre los Recursos Naturales, Universidad Michoacana de San Nicolás de Hidalgo, Av. San Juanito Itzicuaro s/n Col. Nva. Esperanza, 58337, Morelia, Michoacán, Mexico.**

**Incilius valliceps and Leptodactylus fragilis. Sharing refuge with a scorpion.** *Incilius valliceps* is a medium-sized (snout–vent length 60–100 mm), terrestrial, and insectivorous *bufonid* characterized by the presence of cranial crests that form a cavity on the dorsal surface of the head, parotoid glands approximately the size of the eyes, the dorsal region is covered with warts, and a highly variable dorsal coloration (Campbell, 1998). This toad occurs from central Veracruz, Mexico, along the Atlantic versant to extreme northeastern Costa Rica, and on the Pacific versant from the Isthmus of Tehuantepec, Mexico, to southeastern Honduras (Leenders, 2016), including throughout the Yucatan Peninsula (Campbell, 1998; Lee, 2000).

*Leptodactylus fragilis* is a small (snout–vent length 33–40 mm), aquatic and terrestrial, and insectivorous leptodactylid characterized by the presence of slender and slightly expanded toes and fingers, a dorsal coloration generally with dark brown, tan, or gray spots or blotches against a paler background, and a conspicuous white stripe on the upper lip of most individuals. This frog occurs from extreme southern Texas, United States, through Mexico and Central America to northern Colombia and Venezuela (Leenders, 2016), including throughout the Yucatan Peninsula (Campbell, 1998; Lee, 2000).

During a diurnal survey on 22 September 2010, I observed an individual of *I. valliceps* and one of *L. fragilis* sheltering under a rock with a scorpion (*Centruroides ochraceus*), a species endemic to southeastern Mexico (Pinkus-Rendón et al., 1999; Lourenço and Sissom, 2000; Figs. 1, 2) The event occurred at Kanasín, Estado de Yucatán, Mexico (20°54′56.03″N, 89°33′9.64″W; datum WGS 84; elev. 3 m) in a patch of secondary vegetation in a quarry undergoing ecological restoration. This note represents the first record of these anuran species sharing a refuge with this scorpion.

---

**Fig. 1.** An *Incilius valliceps* found sharing a refuge (under a rock) with a scorpion, *Centruroides ochraceus*. © Jorge Armin Escalante-Pasos

**Fig. 2.** A *Leptodactylus fragilis* sharing the same rock with the scorpion, *Centruroides ochraceus*. © Jorge Armin Escalante-Pasos
**Literature Cited**


**Jorge Armín Escalante-Pasos**

_Instituto de Biología, Universidad Nacional Autónoma de México. Ciudad Universitaria, C.P. 04510, Ciudad de México._ Mexico. E-mail: j.escalantepasos@gmail.com

*Rana juliani*. Vocalization. Frogs typically produce calls with the aid of a vocal sac (Hayes and Krempels, 1986; Vitt and Caldwell, 2014). Vocal sacs enable a frog to call efficiently (Bucher et al., 1982) and increase the conspicuousness of the call (Gridi-Papp, 2008), although they do not serve as cavity resonators as is popularly believed (Bucher et al., 1982; Rand and Dudley, 1993; Gridi-Papp, 2008). In addition to aiding in vocalization, vocal sacs can serve multiple communication functions as visual cues (Narins et al., 2003), vibrational cues (Lewis et al., 2001), and chemical signals (Starnberger et al., 2013; Starnberger et al., 2014). In frog species where vocalization does not play a large role in communication, other methods of signaling are used (e.g., foot signaling; Lindquist and Hetherington, 1996). Nevertheless, there are examples of frogs without vocal sacs that vocalize, albeit usually at a reduced volume (Hayes and Krempels, 1986).

On 5 March 2016, along Dry Creek (17°03’06.6"N, 88°34’07.9"W; UTM; elev. 184 m) near Hummingbird Highway in Middlesex, Belize, VK observed an adult *Rana juliani* produce a distress call while being handled (Fig. 1). On 21 June 2016, further upstream on Dry Creek (17°02’16.6”N, 88°33’49.5”W; UTM; elev. 500 m) KLJ observed six additional individuals produce a distress call when handled. *Rana juliani* lacks a vocal sac and vocal slits, and the original description noted that vocalizations are not known (Hillis and de Sá, 1988). To the best of our knowledge, no other reports of *R. juliani* vocalization exist.

A vocal sac and the presence of slits varies slightly in a sister species (*R. vaillanti*) that vocalizes (Hillis and de Sá, 1988; Hillis and Wilcox, 2005). In Hillis and de Sá’s (1988) description, 88.7% of the specimens of *R. vaillanti* examined had vocal sacs and slits, yet they did not state whether individuals that lacked vocal sacs and slits vocalized or not. *Rana vaillanti* produces distress calls (Guyer and Donnelly (2005), and if vocal sac-less individuals are able to vocalize, the mechanism might be similar in *R. juliani*.

![Fig. 1. A *Rana juliani* observed vocalizing at Dry Creek, Middlesex, Belize. A video of the distress call is available at the following address: https://www.youtube.com/watch?v=mNaTFL2rSSM&feature=youtu.be](https://www.youtube.com/watch?v=mNaTFL2rSSM&feature=youtu.be) © Vanessa Kilburn
**Acknowledgments.**—We thank the Toucan Ridge Ecology and Education Society (T.R.E.S.) Hosting Center for accommodations and staff assistance in the field, and Alexander Shepack for comments on the manuscript.

**Literature Cited**


**Connor M. French¹, Vanessa Kilburn², and Krista L. Jäger³**

¹Department of Zoology, Southern Illinois University, 1125 Lincoln Drive, Life Science II, Room 256, Carbondale, Illinois 62901, United States. E-mail: connor.french@siu.edu (Corresponding author)

²Toucan Ridge Ecology and Education Society, 27.5 Miles Hummingbird Highway, Middlesex, Stann Creek, Belize.

³Department of Biology, Dalhousie University, 1355 Oxford Street, Life Science Centre, Halifax, Nova Scotia B3H 4R2, Canada.

---

**Smilisca sordida** (Peters, 1863). Diet. The Drab Treefrog, *Smilisca sordida*, is a species with a distribution extending from Honduras to western Panama, as well as in the Magdalena Valley of Colombia, at elevations from sea level 1,525 m (Savage, 2002; Köhler, 2011). During the breeding season, males of this species prefer to perch at the level of the water or a few centimeters higher, where they vocalize to attract females or to reclaim their territories, and females normally are found perched at 1 m or more in height (MAGC, pers. observ.). During amplexus, females construct basins in which to deposit their eggs (Malone, 2004). Males of *S. sordida* are smaller (maximum snout–vent length [SVL] 45 mm) than females (maximum SVL 65 mm) (Duellman and Trueb, 1966).

Predation of anurans on other vertebrates mainly has been recorded in the larger species, and is relatively uncommon in smaller species or individuals (Franca et al., 2004). The diet of Neotropical hylids primarily is based on terrestrial arthropods of various sizes and is directly related to the size of the anuran (Malone, 2006), and predatory events on fishes have not been recorded in most of these hylids (de Paula Lima et al., 2010).
On 10 January 2017, at Quebrada Lajas, San Antonio de Escazú, Provincia de San José, Costa Rica, at an elevation of ca. 1,200 m, while conducting a stomach content analysis by stomach eversion of living frogs (Giaretta et al., 1998), in both males and females of *S. sordida*, we located a male (Fig. 1) on a small sand bank next to a stream. Upon extracting the stomach contents from the individual, some pale-colored, fish-smelling contents emerged, which previously we had not recovered from any other individuals of *S. sordida*. After examining the contents in more detail, we found the remains of bony spines, scales, and skin, in addition to a skull and some soft tissues (Fig. 2A). On 23 January 2017, we continued the sampling and in another male *S. sordida* found similar remains, but this time consisting of bone parts and scales, which we identified as two individuals of the same species of poeciliid fish (Fig. 2B). Further, we identified the stomach contents of both samples as those of juveniles of *Brachyrhaphis* sp., which we determined to be juveniles based on size of the individuals (Bussing, 1998). Interestingly, directly adjacent to where the male frogs were collected the water was less than 5 cm deep, and thus the movement of the fish perhaps attracted the frogs. This species of fish apparently was the only one found in the stream.

**Fig. 1.** (A) A male *Smilisca sordida* found in a stream at Quebrada Lajas, San Antonio de Escazú, Provincia de San José, Costa Rica. © Marlon A. Guerrero Castro

**Fig. 2.** Stomach contents showing the first records of predation on a poeciliid fish by the treefrog *Smilisca sordida*. (A) The remains of bony spines, scales, skin, a skull, and soft tissues; and (B) the remains of two fishes, including the upper part of their skulls and some bones and skin, with the soft tissues apparently having been digested. © Marlon A. Guerrero Castro
Reptilia: Crocodylia

Size-related habitat partitioning of yearling, juvenile, and subadult *Caiman crocodilus* in the Refugio Bartola region of Nicaragua

The socioeconomic pressures associated with increasing tourism and commerce in Nicaragua are rapidly transforming the aquatic ecosystems generally inhabited by *Caiman crocodilus* (Cropper and Griffiths, 1994). This species inhabits lowland wetland and riverine habitats throughout its range, which extends from the Isthmus of Tehuantepec, Mexico, to southern Ecuador, on the Pacific versant, and on the Atlantic versant from eastern Honduras to northern Colombia, Venezuela, and the Guianas and throughout the Orinoco- and Amazon basins to eastern Peru and central Brazil (Savage, 2002). Data on the behavior and ecology of *C. crocodilus* in Nicaragua, such as habitat niche partitioning, is lacking, and here we provide baseline information on niche partitioning in this species in the vicinity of Refugio Bartola, Nicaragua.

From 3 to 18 February 2013, we conducted capture surveys on a motorboat (8 m long, 40 hp) 30 min after sunset along a 2 km stretch of the Río San Juan and 1 km of the Río Bartola at the intersection with Refugio Bartola (10°58'19.80"N, 84°20'23.39"W) as part of the University of California, Los Angeles Field Biology Quarter. We pre-determined our field survey distance based on information provided by local people on the high density of *C. crocodilus* in this area of Refugio Bartola. We classified the *C. crocodilus* as yearlings (TL = < 50 cm), small juveniles (TL = 51–76 cm) and large juveniles/subadults (TL = > 76 cm). We also recorded the type of habitat in which they resided, and organized habitat types into the following five categories: (1) near bank vegetation (individual near slope of vegetated bank), (2) swamp/marsh (individual protruding from the water near aquatic vegetation), (3) near bank (individual near slope of bank, without vegetation), (4) on bank (individual on bank, with or without vegetation), and (5) open river (individual in middle 50% of river).

We captured 49 *C. crocodilus* during our field survey (yearlings: *n* = 30; small juveniles: *n* = 9; and large juveniles/subadults: *n* = 10). Most of the yearlings (47%) preferred habitats near banks with vegetation, whereas a majority of the large juveniles and subadults preferred to be near banks without vegetation (40%). Small juveniles

**Marlon A. Guerrero-Castro and Mario Gaitan Arce**

Escuela de Ciencias Biológicas, Universidad Nacional de Costa Rica (UNA), Campus Omar Dengo, Heredia, Costa Rica. E-mail: marlonguerrero120@gmail.com (MAGC, Corresponding author)
did not appear to prefer banks, with or without vegetation (Table 1). A further examination of class percentage in each of the habitat types suggests that yearlings prefer areas with dense vegetation (70%), small juveniles inhabit areas with dense vegetation and near banks about equally, and 80% of the individuals sampled in the open river were larger animals.

Our goal here is to provide baseline information on *C. crocodilus* for future research in Refugio Bartola. In general, we found that yearlings preferred habitats in which vegetative cover is easily accessible, such as near well-vegetated banks or in swampy marsh habitats, whereas larger juveniles and subadults primarily were observed near banks that lacked vegetation or in open water. Small juveniles did not show a preference for a particular habitat, as they inhabit areas with a high density of foliage, as well as those that lack vegetation. We also observed repeated site fidelity by individual *C. crocodilus*, a common behavior shown by this species throughout its range (Ouboter and Nanhoe, 1988; Gorzula and Seijas, 1989). Overall, our results likely reflect an ontogenetic dietary preference of prey, territoriality, and predator and conspecific avoidance (Gorzula, 1978; Thorbjarnarson, 1993a, b; Silveira and Magnusson, 1999; Riley and Huchzermeyer, 1999). Given the ontogenetic shift in habitat preference during the earlier life history states that likely contribute to the survival of young individuals, the preservation of various habitats is warranted for any conservation plan involving *C. crocodilus* in the vicinity of Refugio Bartola to be effective.

### Table 1. Percentage of habitat preference by size class of *Caiman crocodilus* around Refugio Bartola, Nicaragua.

<table>
<thead>
<tr>
<th>Yearlings</th>
<th>Near Bank Vegetation</th>
<th>Swamp/Marsh</th>
<th>Near Bank</th>
<th>On Bank</th>
<th>Open River</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>47%</td>
<td>23%</td>
<td>20%</td>
<td>7%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>(n = 14)</td>
<td>(n = 7)</td>
<td>(n = 6)</td>
<td>(n = 2)</td>
<td>(n = 1)</td>
</tr>
<tr>
<td>Small Juveniles</td>
<td>4%</td>
<td>1%</td>
<td>44%</td>
<td>11%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>(n = 3)</td>
<td>(n = 1)</td>
<td>(n = 4)</td>
<td>(n = 1)</td>
<td>(n = 0)</td>
</tr>
<tr>
<td>Large Juveniles/Subadults</td>
<td>10%</td>
<td>10%</td>
<td>40%</td>
<td>10%</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>(n = 1)</td>
<td>(n = 1)</td>
<td>(n = 4)</td>
<td>(n = 1)</td>
<td>(n = 3)</td>
</tr>
</tbody>
</table>

**Acknowledgments.**—We thank Dr. Greg Grether and Dr. Debra Shier for their guidance in designing this Field Biology Quarter study via the Ecology and Evolutionary Biology Department at UCLA. We are grateful to Alice Leung, Jonathan Drury and Rachel Chock for their assistance in the field, and extend a special thanks to the staff of Refugio Bartola for their extensive help in conducting this study.

**Literature Cited**


**Ali Haghighi¹ and Marisa Tellez²**

¹Crescent Village Circle, Unit 1265, San Jose, California, United States 95134. E-mail: haghighi21@gmail.com

²Crocodile Research Coalition, Maya Beach, Stann Creek, Belize. E-mail: marisa.tellez@crcebelize.org
**Reptilia: Squamata (lizards)**

**Hemidactylus frenatus. Predation by a Turquoise-browed Motmot (Eumomota superciliosa; Momotidae).** The Common House Gecko, *Hemidactylus frenatus*, is a small, nocturnal species native to Southeast Asia but introduced worldwide in tropical and subtropical regions (Csurhes and Markula, 2016), and likely was introduced into Costa Rica after 1990 (Savage, 2002). This species adapts remarkably well to human settlements and highly human-modified habitats (Jiménez et al., 2015). In Costa Rica, natural predators of this gecko include snakes, birds, scorpions, and spiders (Barquero and Hilje, 2005; Abarca and Knapp, 2009; Domínguez-De la Riva and Carbajal-Márquez, 2016). The Turquoise-browed Motmot (*Eumomota superciliosa*) is an abundant species distributed from southern Mexico to northwestern Costa Rica (Garrigues, 2007). The diet of *E. superciliosa* is broad and includes a variety of insects, such as caterpillars, butterflies, and beetles, in addition to worms, spiders, and lizards (Skutch, 1947; Stiles and Skutch, 2007).

On 9 July 2016 at 1135 h, we observed an individual of *E. superciliosa* feeding on an adult *H. frenatus* at Playa La Penca, Distrito de Sardinal, Cantón de Carrillo, Provincia de Guanacaste, Costa Rica (10°34'18"N, 84°41'54"W; WGS 84); elev. 40 m. The bird was perched on an exposed branch of a leguminous tree holding the gecko in its beak (Fig. 1). The bird continued holding the gecko for nearly 25 min, then flew off with its prey and was not observed swallowing it. *Eumomota superciliosa* often remains perched until locating a prey item, and after catching the prey will beat it against a branch before consuming it; perhaps this is the reason why the *H. frenatus* was missing its tail (Fig. 1). Although *E. superciliosa* sometimes bites on the head of the lizards to swallow them more easily, in this case the head of the gecko looked complete, so perhaps the bird recently had captured the gecko.

*Hemidactylus frenatus* is an invasive species, and thus it is important to know its predators because they might help prevent its dispersal. In this regard, the House Wren (*Troglytes aedon*) and the Great-tailed Grackle (*Quiscalus mexicanus*) have been reported to prey on this species (Barquero and Hilje, 2005; Rojas-Gonzalez and Wakida-Kusunoki, 2012). These birds, however, are diurnal and geckos are primarily nocturnal. Nonetheless, *E. superciliosa* has been reported to feed at night near lights where insects are attracted (Thurber and Komar, 2002). Because *H. frenatus* also feeds on insects attracted by nocturnal lights, *E. superciliosa* might represent a potential predator of *H. frenatus* in Costa Rica. This report is the first to document predation of *H. frenatus* by *E. superciliosa*.

![Fig. 1. A Turquoise-browed Motmot (*E. superciliosa*) holding a Common House Gecko (*Hemidactylus frenatus*) in its beak at Playa La Penca, Distrito de Sardinal, Cantón de Carrillo, Provincia de Guanacaste, Costa Rica.](image) © Fabián Araya
**LITERATURE CITED**


---

**Fabian Araya Yannarella¹ and Juan G. AbArCa²**

¹Escuela de Ciencias Biológicas, Universidad Nacional de Costa Rica, Heredia, Apdo.86-3000 Heredia, Costa Rica. E-mail: fabian.araya.yannarella@una.cr

²Sistema de Estudios de Posgrado, Facultad de Microbiología, Universidad de Costa Rica, San Pedro Montes de Oca, Apdo. 20–60 San José, Costa Rica. E-mail: barcazajuan@gmail.com (Corresponding author)

---

**Lepidophyma sylvaticum. Captive birth.** The Madrean Tropical Night Lizard, *Lepidophyma sylvaticum*, is endemic to Mexico and occurs in the states of Puebla, Hidalgo, Nuevo León, Querétaro, San Luis Potosí, Tamaulipas, and Veracruz, at elevations from 300 to 1,800 m (Canseco-Márquez et al., 2000; Ramírez-Bautista et al., 2014). This species inhabits tropical rainforest, cloud forest, and pine-oak forest (Bezy and Camarillo-Rangel, 2002; Ramírez-Bautista et al., 2014). Reproduction in *L. sylvaticum* has been documented relatively well, as the reproductive period in this viviparous species occurs during spring and summer, and the litter size is known to range from 1 to 7 neonates (*x* = 4.7 ± 0.39, *n* = 18; Ramírez-Bautista et al., 2008). Lemos-Espinal and Dixon (2010) reported two females from Querétaro collected on June 17 and 19 that contained 5 and 8 embryos, respectively, while none of the females collected in August contained embryos. A female collected in Tepehuacán de Guerrero, Hidalgo, measuring 87.5 mm in snout-vent length (SVL), gave birth to three neonates with a mean SVL of 38.7 mm and a body mass of 0.3358 g (L. Badillo-Saldaña, pers.comm). Data on reproduction, however, remains absent for several areas of its distributional range, such as in Tamaulipas.

On 24 June 2012, a pregnant female (CAR-ITCV-0158) was collected under a rock in pine-oak forest, on a rocky hillside with herbaceous vegetation, at Rancho El Tejocote (23°41’20.80”N, 99°16’12.56”W; WGS 84; elev. 1,775 m), Victoria, Tamaulipas, Mexico. The measurements of the individual were as follows: SVL = 62.3 mm; tail length (TL) = 42.7 mm; head length = 14 mm; and head width = 8.5 mm. This female was taken to the laboratory, where it was placed in a terrarium and maintained in conditions similar to those in its natural environment. Six days later the female gave birth to three neonates (CAR-ITCV-0159: SVL = 27.1 mm, TL = 30.2 mm; CAR-ITCV-0160: SVL = 28 mm, TL= 32 mm; and CAR-ITCV-0161: SVL = 27.3 mm, TL [partially incomplete] = 12.7 mm). The color pattern of the neonates was similar to that of the mother but more vividly defined, as has been reported for this species and other members of the genus *Lepidophyma* (Dixon and Lemos-Espinal, 2010).
The number of offspring and the SVL of the neonates in this report was similar to that observed for this species in Tepehuacán de Guerrero, Hidalgo (L. Badillo-Saldaña, pers. comm.), although it is below the reported average for this species (Ramírez-Bautista et al., 2008; Lemos-Espinal and Dixon, 2010). According to the available data, a variable litter size has been reported for \textit{L. sylvaticum}, such as in other species of this genus (e.g., \textit{L. flavimaculatum}, \textit{L. pajapanensis}; see Ramírez-Bautista et al., 2008). The lack of a more structured litter size and the wide variety of environments in which this species occurs suggests that litter size might be determined more by local adaptations than by phylogeny.

\textbf{Acknowledgments}.—A special thanks goes to Miguel A. Terán-Juárez, Racioel Crúz-Elizalde, Christian Berriozabal-Islas for logistical support. The collecting permit (SGPA/DGVS/04989/11) was issued by SEMARNAT (Secretaría del Medio Ambiente y Recursos Naturales) to ARB.

\textbf{Literature Cited}


\textbf{Lemos-Espinal, J. A. and J. R. Dixon}. 2010. Anfibios y Reptiles del Estado de Querétaro, México / Amphibians and Reptiles of the State of Querétaro, Mexico. Texas A&M University, College Station, Texas, United States, Universidad Nacional Autónoma de México, Tlalnepantla, Estado de México, and Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, México, D.F., Mexico.


\textbf{Sergio A. Terán-Juárez}¹, \textbf{José Daniel Lara-Tufiño}², and \textbf{Aurelio Ramírez-Bautista}²

¹División de Estudios de Posgrado e Investigación, Instituto Tecnológico de Ciudad Victoria, Boulevard Emilio Portes Gil No. 1301, C.P. 87010, Ciudad Victoria, Tamaulipas, Mexico. Email: sergioatj@gmail.com (Corresponding author)

²Laboratorio de Ecología de Poblaciones, Centro de Investigaciones Biológicas, Instituto de Ciencias Básicas e Ingeniería, Universidad Autónoma del Estado de Hidalgo, Km 4.5 Pachuca-Tulancingo, 42184, Mineral de la Reforma, Hidalgo, Mexico.

\textbf{Norops biporcatus} (Wiegmann, 1834). \textbf{Color change during foraging}. Reptiles use body colors for many purposes: camouflage, warning predators, mate choice, and thermoregulation, among others (Cooper and Greenberg, 1992). The body color of anoles results from a combination of three pigments (pteridines, carotenoids, and drosopterines), as well as from structural coloration (Macedonia et al., 2000). These lizards are known for their ability to change color by expanding or contracting melanin in their skin cells (Horowitz, 1958). One of the best-studied cases of color change in anoline lizards involves \textit{Anolis carolinensis}, in which the evidence presented shows that this species changes color to match its background (Hadley, 1929; Kleinholz, 1938; Dores et al., 1987). Nonetheless, Jenssen et al. (1995) found the opposite in that lizards mismatched their background more than would be expected by chance. Other studies also have shown that \textit{A. carolinensis} changes its skin color during sexual interactions, territorial defense, stress, predation, and according to the temperature and light conditions (Greenberg et al., 1984; Cooper and Greenberg, 1992; Jenssen et al., 1995).
On 9 October 2016, at Centro Científico Kekoldi, Talamanca, Provincia de Limón, Costa Rica (09°37'56"N, 82°47'12"W; WGS 84) we observed a female *N. biporcatus* perched on an inflorescence of *Sanchezia parvibracteata* (Acanthaceae), next to the guest house. The lizard was preying on stingless bees (Apidae: Meliponini) that approached the flowers. While perching, the individual’s color was dull brown, but when potential prey approached the lizard attempted to catch it, and the lizard turned bright green (Fig. 1). Most of the time the eating attempts were successful, and after eating a bee the lizard returned to its normal dull brown coloration. We observed the lizard changing color at least 10 times in a time period of about 30 min. Little information is available regarding color change in anoles, other than in *A. carolinensis*. To our knowledge this is the first report of color change during prey capture in *N. biporcatus*.

**Acknowledgments.**—We thank the staff of Centro Científico Kekoldi for support in the field; José Esteban Jiménez Vargas and Fabián Araya Yanarella for helping to identify the plant where we observed the lizard; Oscar Ramirez for providing the geographic coordinates; and Jennifer Stynoski for offering helpful suggestions on the language.

**Literature Cited**


**Carolina Esquivel and Francisco Vargas-Acuña**

Escuela de Ciencias Biológicas, Universidad Nacional, Costa Rica, Apartado postal 86-3000, Heredia, Costa Rica. E-mails: caroesquiveldobles@gmail.com and franciscov89@gmail.com (CE, Corresponding author).
**Clelia clelia. Predation on Basiliscus basiliscus.** *Clelia clelia* (Daudin, 1803) is a large dipsadid snake with a broad distribution that extends from southern Mexico southward to Bolivia, and Argentina, including the islands of Trinidad, Granada, and Dominica (Campbell, 1998; Wallach et al., 2014). This species is well known for its ophiophagous habits and feeds on a variety of snakes, including venomous ones (Savage, 2002; Solórzano, 2004; Chavarría and Barrio-Amorós, 2015). Savage (2002) and Solórzano (2004) indicated lizards and small mammals in its diet, but did not mention the species.

Herein we report a young adult *C. clelia* subduing and likely eating an adult female *Basiliscus basiliscus*. The event occurred at Finca Econaturalistica La Tarde, located near La Palma, Cantón de Osa, Provincia de Puntarenas, Costa Rica. On 19 June 2016 at ca. 1225 h, in thick vegetation near the ground along a riverbank, DP discovered a *C. clelia*, total length (TL) > 1 m, attempting to eat an adult female *B. basiliscus*, TL ca. 40 cm. The *Clelia* was biting the *Basiliscus* on the throat while constricting its lower abdomen. The lizard remained motionless for a few minutes, with its front legs stretched, but at that point it was not subdued. After releasing the throat of the *Basiliscus*, the *Clelia* began flicking its tongue along the lizard’s body. Upon reaching the head, the *Basiliscus*, in apparent desperation, bit the snake’s lower jaw. The bite caused no harm to the *Clelia*, but the snake retracted its head from view while still constricting the lizard’s lower body, and then reappeared and bit the *Basiliscus* on the neck, this time sinking its teeth in. The encounter lasted for 25 min, with the snake still holding and biting the lizard, which appeared subdued, but we left before witnessing the ingestion process. We show the sequence of events in Fig 1.

**Fig. 1.** A Young adult *Clelia clelia* subduing an adult female *Basiliscus basiliscus* at Finca Ecoturistica La Tarde, Península de Osa, Provincia de Puntarenas, Costa Rica. © Sergei Timofeevski
**Literature Cited**


**SERGEI TIMOFEEVSK1, DIONISIO PANIAGUA2, NICOLE TIMOFEEVSK1, AND CÉSAR L. BARRIO-AMORÓS3**

17790 Calle Mejor, Carlsbad, California, United States.
2498302 Puerto Jiménez, Golfito, Puntarenas, Costa Rica.
3Doc Frog Expeditions, Uvita, Costa Rica. E-mail: cesarlba@yahoo.com (Corresponding author)

**Conophis lineatus** (Duméril, Bibron & Duméril, 1854) Diet. *Conophis lineatus* is a colubrid with a distribution extending from Veracruz and Oaxaca, Mexico, to Costa Rica on the Atlantic versant, and on the Pacific versant from Chiapas, Mexico, to Costa Rica; this species inhabits dry and humid forests, secondary vegetation, savannas, pastures, and natural clearings (Campbell, 1998; Lee, 2000; Stafford and Meyer, 2000; Köhler, 2008; McCranie, 2011). Often encountered on trails, this snake commonly is referred to as the “guarda camino” (road guarder). *Conophis lineatus* is diurnal and its diet is known to include mainly lizards (*Aspidoscelis, Holcosus*, and *Sceloporus*), frogs (*Leptodactylus* sp.), toads (*Incilius luetkenii*) and snakes (*Micrurus* spp., in captivity); individuals also have been observed feeding on a juvenile *Ctenosaura similis*, a Gaumer’s Spiny Pocket Mouse (*Heteromys gaumeri*), and the eggs of ground-nesting birds (Wellman, 1963; Campbell, 1998; Rodríguez García et al., 1998; Stafford and Henderson, 2006; Pérez-Higareda et al., 2007; Hernández-Gallegos et al., 2008; Köhler, 2008; Mays, 2010).

On March 8, 2014 at 1001 h, in the port of Sisal, Municipio de Hunucmá, Yucatán, Mexico (21.1669865°N, -90.024357°E; datum WGS 84; elev. 3 m), GMGR observed an adult *C. lineatus* among grasses in a coastal dune (mainly *Passiflora foetida*, *Ernodea littoralis*, and *Canavalia rosea*) consuming a *Holcosus gaigeae* (Meza-Lázaro and Nieto-Montes de Oca, 2015; Fig. 1). The *C. lineatus* captured the *H. gaigeae* by biting one of

**Fig 1.** A *Conophis lineatus* capturing an adult *Holcosus gaigeae* on a coastal dune at Sisal, Municipio de Hunucmá, Estado de Yucatán, Mexico.

© Gilda María Gómez-de Regil
the lizard’s hind legs. The snake then coiled around the *H. gaigeae* for about 5 min, which prevented its movement and presumably allowed the venom to take effect, and subsequently positioned itself toward the snout of the lizard and swallowed it. This observation represents the first record in this region of *C. lineatus* feeding on *H. gaigeae*.

**Literature Cited**


---

Gilda María Gómez-de Regil\(^1\) and Jorge Armín Escalante-Pasos\(^2\)

\(^1\)Campus de Ciencias Biológicas y Agropecuarias. Universidad Autónoma de Yucatán. Carretera Mérida-Xmatkuil Km 15.5, C.P. 97000, Mérida, Yucatán, México. E-mail: gildota8610@gmail.com

\(^2\)Instituto de Biología, Universidad Nacional Autónoma de México. Ciudad Universitaria, C.P. 04510, Ciudad de México, México. E-mail: j.escalantepasos@gmail.com

**Oxybelis aeneus** (Wagler, 1824). **Maximum elevation.** This member of the family Colubridae is widely distributed in the New World, from southern Arizona southward along the eastern and western coasts of Mexico, reaching the margins of the Central Plateau and across the Isthmus of Tehuantepec, through most Central America and reaching northern Peru and northern Argentina in South America, as well as the on the islands of Trinidad and Tobago (Keiser, 1982; Savage, 2002). *Oxybelis aeneus* occurs in a variety of vegetation types, including low deciduous forest, medium subperennifolia forest, subtropical scrubland, dry forest, riparian vegetation, and also is known to penetrate the edge of oak forest (Keiser, 1982; Vázquez-Díaz and Quintero-Díaz, 1997; 2005; Ramírez-Bautista et al., 2014).

In Mexico, *O. aeneus* has been reported at elevations from sea level to 1,920 m (in the state of Hidalgo; Ramírez-Bautista et al., 2014). Stebbins (2003: 403), however, previously noted the elevational range of this species as from “sea level to around 8,200 ft. (2,500 m).” Because no published records of *O. aeneus* from the countries where this species occurs approximate this elevation, presumably the location referred to by Stebbins (2003) was in
Arizona, in the United States; nonetheless, no locality information or a specimen number were provided in Stebbins (2003). Because we have been unable to track down a museum specimen with such an elevation in several museum collections in the United States, herein we report the maximum elevation for *O. aeneus* in Mexico, and unless a specimen with the elevation of 2,500 m is found, perhaps the elevation we report herein (see below) tentatively can serve as the verified elevational record for this species.

On 24 April 2005 at 1540 h, we encountered a female *O. aeneus* (total length [TL] 1,340 mm, body mass 40 g) crossing a dirt road in subtropical scrub in Aguascalientes (21.743656°N, -102.713596°W; WGS 84) at an elevation of 2,251 m, which was the highest elevation known for the state. Subsequently, on 5 November 2016 at 1248 h, we found another active female (TL 1,170 mm, body mass 30 g), crossing a dirt road in an ecotone between subtropical scrub and oak forest in Municipio de San José de Gracia, Aguascalientes (22.055463°N, -102.732473°W; WGS 84) at an elevation of 2,381 m. A photo voucher of this individual is deposited at the San Diego Natural History Museum (SDSNH_HerpPC_05345), and represents the highest known elevation for *O. aeneus* in Mexico, and perhaps from throughout this species’ range. Our observations increase the elevation of *O. aeneus* in Mexico by 461 m, and also suggest that this species penetrates oak forest; Mendoza-Quijano et al. (2006) noted the presence of *O. aeneus* in tropical montane cloud forest, and perhaps the ability of this species to occupy such diverse habitats has resulted in it’s broad distribution. In Mexico, this species sometimes finds shelter in oak forest during the driest months of the year, in areas where food is available and the microclimate is are favorable for its activities.

**Acknowledgments.**—We thank Bradford Hollingsworth for providing the photo voucher number, and the project: The Herpetofauna of Aguascalientes, México, and Carolina Chávez-Floriano, Roberto Roque-Lozano, Juan Manuel García-Alcántara and Sandra Cecilia Hernández-Rodríguez for field assistance. We also thank Louis Porras for comments that helped improve the manuscript. The specimen was collected under scientific permit number SGPA/DGVS/030709/16 issued by the Secretaria de Medio Ambiente y Recursos Naturales (SEMARNAT).

**Literature Cited**


**Gustavo Ernesto Quintero-Díaz**1,2 and **Rubén Alonso Carbajal-Márquez**2,3

1Universidad Autónoma de Aguascalientes, Centro de Ciencias Básicas, Departamento de Biología. C. P. 20131, Aguascalientes, Aguascalientes, Mexico. E-mail: gequintmxags@hotmail.com (Corresponding author)

2Conservación de la Biodiversidad del Centro de México, A. C. Andador Torre de Marfil No. 100, C. P. 20229, Aguascalientes, Aguascalientes, Mexico.

3El Colegio de la Frontera Sur. Departamento de Conservación de la Biodiversidad. Unidad Chetumal, Av. Centenario Km 5.5, 77014, Chetumal, Quintana Roo, Mexico.
Trimorphodon tau Cope, 1870. Maximum elevation. This member of the family Colubridae is endemic to Mexico, and occurs in all of the states north of the Isthmus of Tehuantepec, except for Coahuila and the Baja California peninsula (Scott and McDiarmid, 1984; Vázquez-Díaz and Quintero-Díaz, 1997; 2005; Canseco-Márquez and Gutiérrez-Mayén, 2006; Lazcano et al., 2010; Lemos-Espinal and Dixon, 2013; Ramírez-Bautista et al., 2014). Specimens have been reported from the Pacific coastal plain and from the central plateau in the foothills of the Balsas and Tepalcatepec basins (Mendoza-Quijano and Hammerson, 2007), from conifer and low deciduous forests (Flores and Gerez, 1994), oak forest, oak-pine forest, xerophytic scrub, grassland, and riparian vegetation (Vázquez-Díaz and Quintero-Díaz, 1997; 2005; Ramírez-Bautista et al., 2014), and from cracks between rocky areas and on canyon slopes (Lemos-Espinal and Dixon, 2013), at elevations ranging from 100 to 2,600 m (Mendoza-Quijano and Hammerson, 2007; Wilson and Johnson, 2010). Several specimens have been reported from Aguascalientes, collected at elevations from 1,920 m (McDiarmid and Scott (1970; UIMNH 27566) to 2,500 m at La Congoja, Municipio de San José de Gracia (Quintero-Díaz et al., 2008).

On 5 November 2016 at 1639 h, an individual of Trimorphodon tau (total length 550 mm, body mass 27.6 g) was found under a rock near a stream in oak-pine forest at an elevation of 2,711 m in Municipio de San José de Gracia, Aguascalientes (22.100602°N, -102.696444°W; WGS 84). A photo voucher of the snake (Fig. 1) is deposited at the San Diego Natural History Museum (SDSNH_HerpPC_05346). This report, therefore, represents the highest known elevation for this species in the state of Aguascalientes, as well as for its entire range. Our record increases the known elevation by 111 m, and confirms the presence of T. tau in oak-pine forest.

Fig. 1. A Trimorphodon tau found in oak-pine forest in Municipio de San José de Gracia, Aguascalientes, Mexico, at an elevation of 2,711 m. © Gustavo E. Quintero-Díaz

Acknowledgments.—We thank Bradford Hollingsworth for providing the photo voucher number, and the project: The Herpetofauna of Aguascalientes, México, and Carolina Chávez-Floriano, Roberto Roque-Lozano, Juan Manuel García-Alcántara, and Sandra Cecilia Hernández-Rodríguez for field assistance. This research was conducted under scientific permit number SGPA/DGVS/030709/16 issued by the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT).
Gustavo Ernesto Quintero-Díaz1,2 and Rubén Alonso Carbajal-Márquez2,3

1Universidad Autónoma de Aguascalientes, Centro de Ciencias Básicas, Departamento de Biología. C. P. 20131, Aguascalientes, Aguascalientes, Mexico. E-mail: gequintmxags@hotmail.com (Corresponding author)

2Conservación de la Biodiversidad del Centro de México, A. C. Andador Torre de Marfil No. 100, C. P. 20229, Aguascalientes, Aguascalientes, Mexico.

3El Colegio de la Frontera Sur. Departamento de Conservación de la Biodiversidad. Unidad Chetumal, Av. Centenario Km 5.5, 77014, Chetumal, Quintana Roo, Mexico.
Reptilia: Testudines

Predation on *Gopherus berlandieri* (Testudines: Testudinidae) by *Rattus norvegicus* (Rodentia: Muridae) in the wild

*Gopherus berlandieri* (Agassiz, 1857) is a tortoise distributed from southern Texas and eastern Coahuila southward to the Sierra Madre Oriental, through a large portion of Nuevo León and Tamaulipas to extreme northern Veracruz (Niño-Ramírez et al., 1999; Lemos-Espinal and Smith, 2007; Legler and Vogt, 2013; Nevárez-de los Reyes et al., 2016), at elevations from sea level to 884 m. Predation on its eggs is known to be undertaken by Western Spotted Skunks (*Spilogale gracilis*), Northern Raccoons (*Procyon lotor*), Common Opossums (*Didelphis marsupialis*), and rats (not identified; Auffenberg and Weaver, 1969), and on adults by Coyotes (*Canis latrans*), Bobcats (*Lynx rufus*), Southern Crested Caracaras (*Caracara plancus*), and Cougars (*Puma concolor*) (Hellgren et al., 2000; Kazmaier et al., 2001; Adams et al., 2006). Lazcano et al. (2005) also documented the consumption of recently hatched young of *G. berlandieri* by an adult *Drymarchon melanurus*, which occurred during a herpetofaunal inventory in the municipality of El Carmen, Nuevo León.

During the second week of October of 2016, an adult female Texas Tortoise (*Gopherus berlandieri*) was brought to the Laboratorio de Herpetología de la Facultad de Ciencias Biológicas de la Universidad Autónoma de Nuevo León for identification, and to bring attention to various injuries on its body. The individual presented the following body measurements (length 17.2 cm, width 13.8 cm, height 7.9 cm), and a body mass of 705.5 g. This individual was found a month earlier before it crossed state highway no. 186 near Zacatequitas, Municipio de Pesquería, Nuevo León (25.804991°N, -100.107417°W; elev. 370 m). Upon visiting this locality we found the habitat in the process of urbanization, with several decades old industrial installations along with recent residential areas, and a few remaining pockets of the original vegetation consisting of Tamaulipan thorn scrub. The Río Pesquería, which is one of the most contaminated in the state (www.milenio.com; www.cronicaambiental.com.mx; both sites accessed 10 December 2016), lies about 100 m from the site of capture.

Upon examining the condition of this individual, we noted a series of injuries to the shell and body, which we identified as resulting from rat bites. The injuries clearly were caused by a large rodent (or rodents), of which the Brown Rat (*Rattus norvegicus*) is relatively abundant in the area. We discarded the possibility of wood rats (*Neotoma* sp.), because their diet consists primarily of vegetable matter, and because their characteristic burrows and typical habitat largely have been reduced in the area. We describe the injuries below (Fig. 1, A–C) using the terminology for scutes and bones in Ernst and Barbour (1989), Hutchison (1991), and Rostal et al., (2014).

1. Absence of toes and claws due to bites and damage to the terminal phalanges on all of the extremities. These wounds were healed.
2. Second costal scute on the right damaged in its anterodorsal quarter, exposing part of the 2nd and 3rd pleural bones.
3. Absence of part of the 2nd and 3rd costal scutes on the right side at the border between the two, exposing part of the 2nd pleural bone.
4. Superficial wound without damage to the underlying bone and with partial regeneration on the lower portion of the 8th marginal scute on the right and the anterodorsal portion of the 9th marginal scute.
5. Superficial wound on the central portion of the 11th marginal on the right side.
6. Superficial damage without exposure of the underlying bone on the supracaudal scute.
7. Superficial wound on the posteroventral portion of the 5th vertebral scute.
8. Complete damage to the 11th marginal on the left side.
9. Entire surface of the 4th coastal on the left side, without exposure of the underlying bone.
10. Wound on the 8th marginal scute on the left side, with accompanying fracture of the 8th peripheral bone.
11. Wound on the gular scute, partially exposing the epiplastron bone.
Fig. 1. (A) Injuries (numbers 1–4), (B) (numbers 5–9), and (C) (number 10) sustained by a female *Gopherus berlandieri* from a *Rattus norvegicus* near Zacatequitas, Municipio de Pesquería, Nuevo León. © Manuel Nevárez de los Reyes


*Rattus norvegicus* is native to southeastern Siberia, northeastern China and parts of Japan (Wilson and Reeder, 1993). This rodent has been introduced throughout the world, and is associated with human settlements where food is available (Álvarez-Romero and Medellín, 2005; Álvarez-Romero et al., 2008); this species is omnivorous, and consumes seeds, grains, fruits, eggs, insects, birds, fish, chickens, piglets, and human waste (Nowak, 1991). Due to its wide distribution, abundance, ability to displace other species of rodents greater in size, aggressiveness, and diet (Bertram and Nagorsen, 1995) it has become a major problem around human settlements.

Attacks by *R. norvegicus* are relatively common on captive turtles, and some authors have emphasized the importance of protecting turtle hatchlings in captivity to avoid predation by cats, birds, and rodents (Avanzi, 2004). Another example of attacks occurs in island ecosystems, such as the destruction of clutches of *Chelonia nigra* by rats, mice, pigs, and goats introduced in the Galapagos Islands archipelago (Rueda-Almonacid, 2007).

Habitat destruction due to the expansion of the Monterrey metropolitan area, which now encompasses 12 municipalities, has been identified as one of the direct threats to the herpetofauna of the central part of Nuevo León (Nevárez et al., 2016), since this region contains 90% of the state’s population. The “secondary” impact due to the anthropization of the environment and the proliferation of the associated exotic fauna, however, had not been documented. As far as we know, no previous records of *G. berlandieri* predation by *R. norvegicus* in the wild are available, so this finding constitutes the first documentation of this interaction.

**Acknowledgments.**—Fieldwork was partly funded by a Grant (No. 445411) to MNR by Consejo Nacional de Ciencia y Tecnología (CONACYT) and Universidad Autónoma de Nuevo León (Programa de Apoyo a la Investigación Científica y Tecnológica [PAICYT CN315-15]). We thank the Gómez-Cantú family for bringing us the tortoise.

**Literature Cited**


Trachemys ornata (Gray, 1831). Diet. The Ornate Slider, Trachemys ornata (Gray, 1831) (Fig.1), is one of the largest endemic freshwater sliders in Mexico (maximum carapace length sizes for adult males and females are 359 mm and 353 mm, respectively), which occurs in the northwestern Mexico from Culiacán, Sinaloa, to the northern coast of Jalisco (Legler and Vogt, 2013, Parham et al., 2015), including in Puerto Vallarta (Casas-Andreu et al., 2015), at elevations below 300 m (Legler and Vogt, 2013).

The diet of T. ornata has not been well documented from throughout its entire distribution. Roots, grass stems, and pieces of broad leaves (not identified to species level) are the only recorded dietary items for this species (Legler and Vogt, 2013). Herein we examined the dietary habits of T. ornata based on the identification of prey items obtained by the technique of stomach flushing (Legler, 1977). To our knowledge, this is the first report of specific prey items, including plants and animals, in the diet of T. ornata.

From 11 to 25 October 2016, we captured seven adult individuals of T. ornata (one male, six females; see Table 1) with traps in a freshwater pond at the campus of the Universidad de Guadalajara (20°42'15.58"N, 105°13'18.49"W; datum WGS 84; elev. 11 m) in Puerto Vallarta, Jalisco, Mexico. The turtles were released after flushing out the stomach contents with water. We found six food items: leaves of the Royal Poinciana Tree, Delonyx regia (Boj. ex Hook.) Raf.; seeds of the Laurel Fig, Ficus microcarpa L. f.; juveniles and adults of the Longarm River Prawn, Macrobrachium tenellum (Smith, 1871); adults of the millipede, Chondromorpha xanthotricha (Attems, 1898); a worker of the Carpenter Ant, Camponotus atriceps (Smith, 1858); and juveniles of the Nile Tilapia, Oreochromis niloticus (Linnaeus, 1758) (Table 1, Fig. 1).

Delonyx regia and F. microcarpa are abundant in the region, but both are no-native species introduced from Madagascar and Asia, respectively (Lesur, 2011); M. tenellum is widely distributed from Mulegé (Baja California Sur) and Yávaros (Sonora), Mexico, to the Río Chira in Peru (Espinosa-Chaurand et al., 2011); C. xanthotricha is a no-native millipede likely from Sri Lanka or India (Shelley and Lehtinen, 1998); C. atriceps is Nearctic and Neotropical in distribution (Alatorre-Bracamontes and Vásquez-Bolaños, 2010); and O. niloticus is a no-native fish introduced from Africa (Contreras-MacBeath et al., 2014).
Table 1. Presence of food items and number of individuals in stomach contents of *Trachemys ornata* specimens. S = number of specimen, EX = sex, M = male, F = female, CL = carapace length in millimeters, and BM = body mass in grams.

<table>
<thead>
<tr>
<th>Food Item</th>
<th>S</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delonyx regia</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ficus microcarpa</td>
<td></td>
<td>40+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Macrobrachium tenellum</td>
<td></td>
<td>11</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Chondromorpha xanthotricha</td>
<td></td>
<td>3</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camponotus atriceps</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oreochromis niloticus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Fig. 1. (A) An individual of *Trachemys ornata* at a freshwater pond in Puerto Vallarta, Jalisco, Mexico; (B) a *Delonyx regia* leaf; (C) *Ficus microcarpa* seeds; (D) an adult *Macrobrachium tenellum*; (E) a *Camponotus atriceps* worker missing its head; (F) adults of *Chondromorpha xanthotricha*; (G) and a juvenile *Oreochromis niloticus*. Scale bar in millimeters (B, C, E, F), and centimeters (D, G). © Frank Mc Cann (A), and Fabio Germán Cupul-Magaña (B–G)
Acknowledgments.—We thank to Armando H. Escobedo Galván and Martha G. Arroyo Joya for their help during our field and laboratory work. We collected the specimen under permit SEMARNAT FAUT-0064.

Literature Cited


Norma E. Hernández-Macías1, Alma Rosa Raymundo-Huizar2, Rafael García de Quevedo-Machain3, Miguel Vásquez-Bolaños1, Gustavo Casas-Andreu4, and Fabio Germán Cupul-Magaña2

1Programa de Doctorado en Ciencias en Producción Agropecuaria de la Universidad Autónoma Agraria Antonio Narro-Unidad Laguna, Periférico y Carretera a Santa Fe, Apdo. Postal 940, Torreón, Coahuila, Mexico.

2Centro Universitario de la Costa, Universidad de Guadalajara, Av. Universidad 203, Delegación Ixtapa, C.P. 48280, Puerto Vallarta, Jalisco, Mexico. E-mail: fabiocupul@gmail.com (Corresponding author)

3Entomología, Centro de Estudios en Zoología, Departamento de Botánica y Zoología, Centro Universitario de Ciencias Biológicas y Agropecuarias, Universidad de Guadalajara, Apdo. Postal 134, Zapopan, Jalisco, Mexico.

4Instituto de Biología, Universidad Nacional Autónoma de México, Apartado Postal 70-153, C.P. 04510, Ciudad de México, Mexico.
First records for the invasive Greenhouse Frog, *Eleutherodactylus planirostris* (Cope, 1862) (Anura: Eleutherodactylidae), in the state of Yucatán, Mexico

The Greenhouse Frog, *Eleutherodactylus planirostris*, is considered one of the most successful invasive anuran species (Bomford et al., 2009). Schwartz (1974) originally reported its introduction in Mexico, based on one specimen collected in Veracruz, but more recent introductions have been documented in three localities in the state of Quintana Roo: Playa del Carmen (Cedeño-Vázquez et al., 2014), Cancún (García-Balderas et al., 2016), and Isla de Cozumel (Pavón-Vázquez et al., 2016). Herein, we provide new information on the distribution of *E. planirostris* in the Yucatan Peninsula, reporting its presence in the state of Yucatán for the first time.

The first individual of *E. planirostris* we documented (UTEP G-2017.5) was found on 20 January 2015 at 1200 h, in a mound of rocks along the edge of an artificial lake in Parque Ecológico “Kai lu um” (21°2′35.37"N, 89°39′14.27"W; WGS 84; elev. 7 m), located in the vicinity of Mérida, Municipio de Mérida. This area had been used as a municipal garbage dump for about 20 years, which was closed down in 1998 and abandoned for 15 years. Subsequently, reforestation and rehabilitation of the contaminated areas were carried out to convert them into green areas, and since then it has become an ecological park.

A second individual (UTEP G-2017.8) was observed on 20 June 2015 at 2230 h, in the garden of a house in Mérida (21°1′22.27"N, 89°39′12.79"W; WGS 84; elev. 6 m). On 7 October 2015 at 1100 h, another frog (UTEP G-2017.6) was found around an artificial pond at Campus de Ciencias Biológicas y Agropecuarias, Universidad Autónoma de Yucatán, located within the Reserva Ecológica Cuxtal, ca. 2 km south of Mérida (20°51′58.52"N, 89°37′25.40"W; WGS 84; elev. 12 m). This reserve has an extension of 10,757 ha, and the vegetation in the area is composed of tropical deciduous forest in different successional stages.

A fourth specimen (UTEP G-2017.9) was observed after a heavy rain on 24 June 2016 at 2200 h, on leaf litter in the garden of another house in Mérida (21°1′5.38"N, 89°36′42.14"W; WGS 84; elev. 10 m).

After these sporadic observations of individual frogs, during a field survey conducted on 4 October 2016 from 2115 to 2340 h, numerous individuals of *E. planirostris* (Fig. 1A, C, E) were observed active on leaf litter at Parque Zoológico del Bicentenario Animaya, ca. 1 km west of Mérida (20°58′59.08"N, 89°41′25.70"W; WGS 84; elev. 6 m). A sample of 31 specimens (including froglets, juveniles, and adult individuals: mean snout–vent length [SVL] = 17.7 mm, range = 10.26–24.07 mm) were collected and deposited in the herpetological collection of El Colegio de la Frontera Sur, Unidad Chetumal (ECO-CH-H3860-3890, Amphibian Collection record number QNR. AN.033.0697).

Additionally, three other frogs of this species were found in a mound of rocks surrounded by grass in an urban park in Mérida (20°58′8.73"N, 89°35′14.37"W; WGS 84; elev. 12 m); one was found on 7 October 2016 (UTEP G-2017.7), and the other two on a second visit to the same site on 11 October 2016.

These six localities demonstrate the scattered presence of *E. planirostris* throughout the municipality of Mérida, indicating that the population of this species is well established. This municipality is located ca. 263.8 km to the WNW (airline distance) of the nearest reported locality in the Yucatan Peninsula at Playa del Carmen, Municipio de Solidaridad, Quintana Roo (Cedeño-Vázquez et al., 2014).

On 20 December 2016 between 1900 and 2000 h, numerous individuals of this invasive species (Fig. 1B, D, F) were found along the perimeter of a house in the village of Emiliano Zapata, Municipio de Oxkutzcab (20°13′32.72"N, 89°28′2.15"W; WGS 84; elev. 58 m), which is located ca. 72.7 km to the SSE (airline distance) of the nearest site in the above-mentioned Municipio de Mérida. The frogs were found under plant pots and rocks, inside chicken coops, on leaf litter, and inside and around puddles of water resulting from laundry activities. A total
of 78 specimens (including froglets, juveniles, and adult individuals: mean SVL = 15.5 mm, range = 7.02–22.66 mm) were collected and deposited in the herpetological collection mentioned above (ECO-CH-H3891-3968). These records indicate that the invasion of *E. planirostris* in Yucatán has spread beyond the urban area of Mérida and into rural areas, possibly through commerce and the transportation of ornamental plants, and we presume that the distribution of this species is wider in the state than the records indicate. As stated by Cedeño-Vázquez et al. (2014) and García-Balderas et al. (2016), studies are urgently needed to evaluate the possible ecological impact of *E. planirostris* invasions in the Yucatan Peninsula.

**Fig. 1.** Individuals of *Eleutherodactylus planirostris* from Municipio de Mérida (A, C, E) and from Emiliano Zapata, Municipio de Oxkutzcab (B, D, F), Yucatán, Mexico.

© Javier A. Ortiz-Medina

**Acknowledgments.**—We thank Mario J. Martinez-Cordero for providing information on one of the observations from Mérida we report herein, and Marcos S. Meneses-Millán and Patricia Cetina-Rivas for field assistance. We also thank Dr. Arthur Harris for kindly providing the voucher numbers of the photographs deposited in the University of Texas at El Paso Vertebrate Digital Collection (UTEP).
**Family Hylidae**

* Ptychohyla leonhardschultzei (Ahl, 1934). MEXICO: OAXACA: Municipio de Santa Catarina Juquila, 3.8 km E of Santa Catarina Juquila (16.236936°N, -97.255507°W; datum WGS 84), elev. 1,794 m; 16 June 2016; Dominic L. DeSantis, Vicente Mata-Silva, Eli García-Padilla, and Larry David Wilson. Two individuals (CIB-5077, CIB-5078; Fig. 1A and 1B, respectively) were found calling while perched on vegetation in a riparian area surrounded by remnants of pine-oak forest; other individuals also were heard calling.

Another individual (CIB-5076, Fig. 1C) was found near El Obispo, in the same municipality (16.175215°N -97.322873°W; WGS 84), elev. 1,216 m; 14 June 2016; Dominic L. DeSantis, Vicente Mata-Silva, Eli García-Padilla, and Larry David Wilson. This frog was calling perched on vegetation next to a stream; other individuals were calling in the area. The three specimens are deposited in the herpetological collection of the Centro de Investigaciones Biológicas of the Universidad Autónoma del Estado de Hidalgo.

These individuals represent new records for the municipality of Santa Catarina Juquila, and slightly extend the distribution of this species in the state ca. 16 and 24 km (3.8 km of Santa Catarina Juquila and near El Obispo, respectively) to the W of various records in the Municipio de San Juan Lachao (Duellman, 2001; Köhler et al. 2016).
Fig. 1. Two adult male Ptychohyla leonhardschultzei (CIB-5077 and CIB-5078, A and B, respectively) from 3.8 km E of Santa Catarina Juquila, and another adult male (CIB-5076, C) from near El Obispo (1C), in Municipio de Santa Catarina Juquila, Oaxaca, Mexico.

Acknowledgments.—We are grateful to Eduardo Mata-Silva for his invaluable assistance in the field, to the Bolán-Mata family for their great hospitality, and to Racidel Cruz-Elizalde, Christian Berriozabal-Islas, and José Daniel Lara-Tufiño for logistical support. The collecting permit (SGPA/DGVS/04287/16) was issued by SEMARNAT to ARB with extensions to VMS, AR, EGP, DLD, and LDW. Irene G. Mayer-Goyenechea kindly provided the voucher numbers.

Literature Cited


Vicente Mata-Silva¹, Dominic L. DeSantis¹, Elí García-Padilla², Arturo Rocha¹, Larry David Wilson³, and Aurelio Ramírez-Bautista⁴

¹Department of Biological Sciences, The University of Texas at El Paso, El Paso, Texas 79968-0500, United States. E-mail: vmata@utep.edu (VMS, Corresponding author)

²Calle Hidalgo, Colonia Santa Úrsula Coapa, Delegación Coyoacán, C. P. 04700, D.F., Mexico.

³Centro Zamorano de Biodiversidad, Escuela Agrícola Panamericana Zamorano, Departamento de Francisco Morazán, Honduras; 16010 SW 207th Avenue, Miami, Florida 33187-1056, United States.

⁴Centro de Investigaciones Biológicas, Instituto de Ciencias Básicas e Ingeniería, Universidad Nacional Autónoma del Estado de Hidalgo, Carretera Pachuca-Tulancingo Km 4.5, Colonia Carboneras, C. P. 42184, Mineral de la Reforma, Hidalgo, Mexico.
Amphibia: Caudata

Family Plethodontidae

Pseudoeurycea conanti Bogert, 1967. MEXICO: OAXACA: Municipio de Zaragoza, Santa Cruz Itundujia, Cerro de las Chiches (16°40'42.99"N, -97°47'33.72"W; WGS 84); elev. 1,942 m; 12 May 2015; Maribel Riaño-García. A photograph of this individual is deposited in the University of Texas at El Paso Vertebrate Digital Collection (Photo voucher UTEP G-2017.4). This voucher (Fig. 1) represents a new municipality record, and narrows the gap between the closest localities ca. 46 km to the N from “near Municipio de Putla Villa de Guerrero” (IUCN SCC Amphibian Specialist Group, 2016), and ca. 86 km to the SSE at La Cumbre, Municipio de Villa de Sola de Vega (Parra-Olea et al., 1999; Mata-Silva et al., 2015). This individual was found crawling in leaf litter at 0850 h, in cloud forest with elements consisting of Pinus douglasiana, Quercus elliptica, Stirax sp., Magnolia sp., Clethra sp., and Carpinus sp. Unfortunately, salamanders (locally known as “niños cueros”) in this region often are killed by most villagers, because of the erroneous belief that they will enter the vagina of women.

Fig. 1. An individual of Pseudoeurycea conanti (UTEP G-2017.4) from Cerro de las Chiches, Santa Cruz Itundujia, Municipio de Zaragoza, Oaxaca, Mexico. © Maribel Riaño-García

Acknowledgments.—A special thanks to Luis Miguel Cruz-González and Dominica García-García for field assistance, and to Arthur Harris for kindly providing the photo voucher number.

Literature Cited


Reptilia: Squamata (lizards)

Family Anguidae

**Gerrhonotus infernalis** (Baird, 1859). MEXICO: DURANGO: Municipio de Santiago Papasquiaro, Mex Hwy 36 between Santiago Papasquiaro and Topia (25.08647°N, -105.54132°W, WGS 84), elev. 2,197 m; 10 August 2008; Ginny N. Weatherman, Coleman M. Sheehy III, Christian L. Cox, and Jacobo Reyes-Velasco. Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autónoma de México (MZFC; field number JAC 29285). Hwy 36 W of Santiago Papasquiaro (25.08665°N, -105.54322°W, WGS 84), elev. 2,200 m; 11 July 2016; R. W. Bryson, Jr. and J. Galvan. Museo de Zoología, Facultad de Estudios Superiores Zaragoza, Universidad Nacional Autónoma de México (photo vouchers MZFZ IMG 17–18). These records extend the known distribution of this taxon ca. 120 (airline) km to the S from the closest recorded site in Durango (Webb and Hensley, 1959) and ca. 185 km to the W of records in eastern Durango (Gadsden et al., 2006). Both specimens were found along the rocky foothills of the Sierra Madre Occidental in Madrean pine-oak forest.

Under the proposed taxonomy of Lemos-Espinal et al. (2004) and Lemos-Espinal and Smith (2007), this population of *Gerrhonotus* is assignable to *G. taylori* Tihen, 1954. Good (1994), however, found no morphological differences between *G. infernalis* and *G. taylori* and subsequently proposed that *G. taylori* be synonymized with *G. infernalis*. Neither Lemos-Espinal et al. (2004) nor Lemos-Espinal and Smith (2009) presented new data to counter Good’s (1994) proposal. We therefore follow the taxonomic recommendations of Good (1994) and Liner and Casas-Andreu (2008) and use the name *G. infernalis* rather than *G. taylori*.

**Literature Cited**


Family Dactyloidae

**Norops sagrei** (Duméril & Bibron, 1837). MEXICO: VERACRUZ: Municipio de Córdoba, Córdoba (18°52′59.42″N, 96°55′27.02″W; WGS 84); elev. 827 m; 16 June 2015. At 1413 h, we encountered a population of **Norops sagrei** (Fig. 1), outside of its known range in Mexico. The population, found in secondary vegetation, consisted of 40 individuals: 12 males, 23 females, and five juveniles. We measured four individuals (Table 1) following the measurements reported by Lee (1996), and deposited a photo voucher in the University of Texas at Arlington Digital Collection (UTADC-8763); all of the lizards were released at the site. Our observation constitutes the first record of this specie in the Altas Montañas de Veracruz, suggesting that this population was transported to this area by vehicle. This report represents a range extension of 275 km to the NE of the closest previously reported locality in Municipio de Minatitlán (IBUNAM:CNAR:19729; Departamento de Zoología, 2016); Mestizo-Rivera (2006) reported this municipality, and according to Álvarez-Romero et al. (2005) it corresponds to the nonnative distribution of this species.

**Table 1.** Measurements of individuals of **Norops sagrei** for Municipio de Córdoba, Veracruz, Mexico. SVL = snout–vent length, and TL = tail length.

<table>
<thead>
<tr>
<th>SVL</th>
<th>TL</th>
<th>Sex</th>
<th>Age Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>62 mm</td>
<td>163 mm</td>
<td>Male</td>
<td>Adult</td>
</tr>
<tr>
<td>55 mm</td>
<td>95 mm</td>
<td>Male</td>
<td>Adult</td>
</tr>
<tr>
<td>54 mm</td>
<td>130 mm</td>
<td>Female</td>
<td>Adult</td>
</tr>
<tr>
<td>34 mm</td>
<td>95 mm</td>
<td>Male</td>
<td>Juvenile</td>
</tr>
</tbody>
</table>

$\bar{x} = 51.25 \pm 10.4 \quad \bar{x} = 120.75 \pm 28.2$

Fig. 1. A male **Norops sagrei** (UTADC-8763) from Córdoba, Veracruz.
Acknowledgments. — We thank to Luis Canseco-Márquez and Sean Rovito for their support in preparing the manuscript, Arleth Reynoso-Martínez for providing the photo of the species, and Carl J. Franklin for cataloguing the digital photograph.

Literature Cited


Dania G. Venerozo-Tlazalo, Ricardo Serna-Lagunes, and Víctor Vásquez-Cruz


Email: victorbiovlc@gmail.com (VBC, Corresponding author)

Family Gekkonidae

Hemidactylus turcicus (Linnaeus, 1758). MEXICO: SONORA: Municipio de Hermosillo, Las Quintas (29.0815°N, 110.9898°W; WGS 84), elev. 195 m; 20 October 2016; Rafael A. Lara-Resendiz. A photograph of this individual was deposited in the national collection of amphibians and reptiles of the Universidad Nacional Autónoma de México (Photo Voucher UNAM; IBH-RF 414). Another individual was found (online record 4153534) in the same municipality, Colonia La Huerta (29.08859°N, 110.97187°W; WGS 84), elev. 203 m; 19 September 2016, and provided by Naturalista (CONABIO, 2016). Both geckos were found on house walls at 2053 h and 2029 h, respectively.

These observations represent a range extension of ca. 103 km to the ENE (airline distance) from nearest record in Bahía de Kino, Sonora (Peralta-García and Valdez-Villavicencio, 2008; Rorabaugh and Lemos-Espinal, 2016).

Acknowledgments. — We thank Víctor Hugo Reynoso-Rosales and Adriana González-Hernández for kindly providing the photo voucher number, and Teresita González-Olea for providing information on the record available on Naturalista.

Literature Cited


First record of *Leptophis ahaetulla* (Linnaeus, 1758) (Squamata: Colubridae) from the state of Yucatán, Mexico

The Green Parrot Snake, *Leptophis ahaetulla*, is one of 11 species currently included in the colubrid genus *Leptophis* (Murphy et al., 2013). In Mexico, this species is found in the states of Veracruz, Tabasco, Campeche, Quintana Roo, Oaxaca, and Chiapas, and its distribution extends southward through Central America to Ecuador, Brazil, and Argentina (Lee, 1996; Campbell, 1998; Köhler, 2008; Johnson et al., 2010; Wallach et al., 2014), at elevations from sea level to 1,300 m (Köhler, 2008). Wallach et al. (2014) included this species in the state of Yucatán, but this information was in error (V. Wallach, pers. comm. to L. Porras).

According to the distribution maps in Lee (1996; 2000), the known range of *L. ahaetulla* in the Península de Yucatán includes localities in Quintana Roo and southern Campeche; these maps suggested (with question marks) the possible occurrence of this species in the eastern portion of the state of Yucatán. More recently, on 1 September 2014 Sabrina Van Remoortere uploaded an observation of *L. ahaetulla* in the iNaturalist online project (www.inaturalist.org; accessed 10 May 2016) from Área de Protección de Flora y Fauna Otoch Ma’ax Yetel Kooh (also known as Reserva Punta Laguna), Municipio de Solidaridad, Quintana Roo (20°38’44.84”N, 87°38’2.71”W; WGS 84; elev. 27 m), from ca. 11.4 km to the E (airline distance) of the border with the state of Yucatán. Presently, however, no published reports are available to confirm the presence of *L. ahaetulla* in the state of Yucatán.

On 16 October 2016 at ca. 1545 h, one of us (MATS) found an adult *L. ahaetulla* at 3.2 km to the SE of Colonia Yucatán, Municipio de Tizimín, Yucatán, Mexico (21°11’40.46”N, 87°42’1.76”W; WGS 84; elev. 15 m Fig. 1); the snake was found dead on the road from La Sierra to San Juan Kilómetro Cuatro, in semi-evergreen tropical forest. We deposited a photograph of the snake at the University of Texas at El Paso Biodiversity Digital
Collection (UTEP G-2017.11). This voucher represents a new state record, located ca. 56.6 km to the NW (airline distance) of the nearest reported locality at Leona Vicario (as “Colonia Santa María”), Quintana Roo (Lee, 1996).

**Acknowledgments.**—We thank Sabrina Van Remoortere for providing information on her observation, and Van Wallach for his communication to Louis Porras. Dr. Arthur Harris kindly provided the photo voucher number.

**Literature Cited**


**Miguel A. Torres-Solís¹, Pedro E. Nahuat-Cervera², and Javier A. Ortíz-Medina²,³**

¹Reserva de la Biosfera Ría Lagartos, Comisión Nacional de Áreas Naturales Protegidas, Calle 18 No.120, Col. Itzimná, C.P. 97100, Mérida, Yucatán, Mexico. Emails: miguel.torres@conanp.gob.mx and miguel.borax@gmail.com

²Campus de Ciencias Biológicas y Agropecuarias, Universidad Autónoma de Yucatán, Km. 15.5 Carr. Mérida-Xmatkuil, C.P. 97315, Mérida, Yucatán, Mexico. E-mail: javiersnake_@hotmail.com (JAOM, Corresponding author)

³Unidad de Manejo para la Conservación de la Vida Silvestre Tsáab Kaan, Km. 2.8 Carr. Baca-Dzemul, C.P. 97450, Baca, Yucatán, Mexico.

**Family Leptotyphlopidae**

*Rena dulcis* Baird and Girard, 1853. MEXICO: HIDALGO: Municipio de Tepeapulco, Cd. Sahagún (19.76959°N, -98.576°W) elev. 2,462 m; 25 May 2016; Abigail Magaly Reyes-Vera. The snake (CIB-5084), found dead by a dog in the morning on the lawn of a house, was donated to the Herpetological Collection of the Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Hidalgo. The specimen represents a new municipality record, with the closest known locality ca. 63.13 km to the SE (airline distance) in the vicinity La Casita, Municipio de Metztitlán (Ramírez-Bautista et al., 2010).

**Acknowledgments.**—A special thanks to Irene G. Mayer-Goyenechea for kindly providing the specimen number.
**Family Typhlopidae**

*Indotyphlops braminus* (Daudin, 1803). MEXICO: HIDALGO: Municipio de Metztitlán, near Los Venados (20.467997°N, -98.679454°W; WGS 84); elev. 1,308 m; 28 August 2016; Cristian Raúl Olvera-Olvera. This individual (Photo voucher CH-CIB 85; Fig. 1) represents a new municipality record, with the closest known locality 54.73 km to the ENE (airline distance) in Tunititlán, Municipio de Chilcuautla (Fernández-Badillo et al., 2015). The snake was found under a rock, in xerophytic scrub. This voucher represents the third record of this species for the state of Hidalgo (Hernández-Salinas and Ramírez-Bautista, 2010; Fernández-Badillo et al., 2015). The photo voucher is deposited in the Photographic Collection of the Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Hidalgo.

**Fig. 1.** *Indotyphlops braminus* (CH-CIB 85) from Los Venados, Municipio de Metztitlán, Hidalgo, Mexico. © Cristian Raúl Olvera-Olvera
Family Viperidae

*Crotalus culminatus* Klauber, 1952. MEXICO: OAXACA: Municipio de Zaragoza, Paraje Río Tigre (16°41'24.58"N, -97°42'41.43"W; WGS 84), elev. 758 m; 13 August 2011; Maribel Riaño-García. A photograph of this individual is deposited in the University of Texas at El Paso Vertebrate Digital Collection (Photo voucher UTEP G-2017.10). This voucher (Fig. 1) represents a new municipality record, and fills a gap between the nearest known localities at ca. 77 km to the SSE and 126 km to the W (airline distance), respectively, in Parque Nacional Lagunas de Chacahua, Municipio de Villa de Tututepec de Melchor Ocampo, Oaxaca (García-Grajales, et al., 2016) and Copala, Guerrero (Armstrong and Murphy, 1979). The individual was found coiled in leaf litter, in habitat consisting of pine-oak forest and a coffee grove.

![Fig. 1. *Crotalus culminatus* (UTEP G-2017.10) found at Paraje Río Tigre, Municipio de Zaragoza, Oaxaca, Mexico.](image)

© Maribel Riaño-García and Yose Riaño-García
Acknowledgments.—A special thanks to Arthur Harris for kindly providing the photo voucher number.

Literature Cited


Maribel Riaño-García¹, Elí García-Padilla², Vicente Mata-Silva³, Dominic L. DeSantis³, and Larry David Wilson⁴

¹Sociedad para el Estudio de los Recursos Bióticos de Oaxaca, A. C. (SERBO, A. C.). Camino Nacional # 80, San Sebastián Tutla, Oaxaca, C. P 71246, Mexico. Email: lebiramriao@gmail.com
²Oaxaca de Juárez, Oaxaca. C. P. 68023, Mexico. Email: quetzalcoatl@gmail.com
³Department of Biological Sciences, The University of Texas at El Paso, El Paso, Texas 79968-0500, United States. E-mails: vmata@utep.edu and dldesantis@miners.utep.edu
⁴Centro Zamorano de Biodiversidad, Escuela Agrícola Panamericana Zamorano, Departamento de Francisco Morazán, Honduras; 16010 SW 207th Avenue, Miami, Florida 33187-1056, United States. E-mail: bufodoc@aol.com

Reptilia: Testudines

Family Kinosternidae

Claudius angustatus (Cope, 1865). MEXICO: YUCATÁN: Municipio de Hunucmá, 3.7 km SE of Sisal (21°8'11.17"N, 90°0'34.72"W; WGS 84); elev. 3 m; 13 December 2016; Jonatán A. Ravell-Ley. Two photographs of the turtle are deposited at the University of Texas at El Paso Vertebrate Digital Collection (Photo Vouchers UTEP G-2017.2 and G-2017.3). The turtle (Fig. 1) was found in the rain at 0936 h, crossing a road through a mosaic of vegetation consisting of mangrove swamp, influenced by flooded tropical forest and flooded grassland. Flooding in this area is seasonal (from July to February), but some bodies of water known as petenes are still available during the dry season, which is the reason why the salinity is low or null. The main plants in this area are Conocarpus erectus and Crescentia cujete, with elements of Acoelorrhaphe wrightii, and the main grasses are Cladium jamaicense and Eleocharis mutata. This voucher represents the second published record of Claudius angustatus for the state of Yucatán, as well as the northernmost record on the Yucatan Peninsula, extending the known distribution of this species 36 km to the NE (airline distance) from the single known reported locality in the state at “20 km E Celestún” (Calderón-Mandujano et al., 2001).
Fig. 1. Two images of an individual *Claudius angustatus* (UTEP G-2017.2 and G-2017.3, respectively) from 3.7 km SE of Sisal, Municipio de Hunucmá, Yucatán, Mexico.

Acknowledgments.—We thank Arthur Harris for kindly providing the photo voucher numbers.

**Literature Cited**


JONATÁN A. RAVELLLEY1, JAVIER A. ORTIZ-MEDINA2,3, AND JUAN B. CHABLE-SANTOS2

1Departamento de Conservación de Ecosistemas, Secretaría de Desarrollo Urbano y Medio Ambiente, Calle 64 #437 x 53 y 47-A Col. Centro, CP. 97000, Mérida, Yucatán, Mexico. E-mail: alexandrinus_86@hotmail.com

2Campus de Ciencias Biológicas y Agropecuarias, Universidad Autónoma de Yucatán, Km. 15.5 Carr. Mérida-Xmatkuil, C.P. 97315, Mérida, Yucatán, Mexico.

3Unidad de Manejo para la Conservación de la Vida Silvestre Tsáab Kaan, Km. 2.8 Carr. Baca-Dzemul, C.P. 97450, Baca, Yucatán, Mexico. E-mail: javiersnake_@hotmail.com (JAOM, Corresponding author)
Two new herpetofaunal records for Stann Creek District, Belize

While the diversity of amphibians and reptiles in Belize is relatively well understood (Stafford et al., 2010), new records of previously overlooked taxa continue to expand our knowledge of their distributions. Here, we report two new records for Stann Creek District, *Bolitoglossa dofleini* and *Ninia diademata*, encountered during a community ecology study performed by RJG between June and September of 2016 at the Toucan Ridge Ecology and Education Society field station. Multiple individuals of each species were captured using funnel traps, and then released. We deposited three photo vouchers of an individual of each species in the San Diego Natural History Museum Department of Herpetology digital collection, and elaborate on the records and their significance below.

**Amphibia: Caudata**

**Family Plethodontidae**

*Bolitoglossa dofleini* (Werner, 1903). BELIZE: STANN CREEK: Stann Creek West Constituency, Toucan Ridge Ecology and Education Society field station, near Middlesex (17.050467°N, 88.567400°W; WGS 84); elev. 192 m; Russell J. Gray. Two individuals were found in evergreen broadleaf forest. One individual found on 5 June 2016 (SDSNH_HerpPC_05350–2; Fig. 1) was digitally vouchered.

The distribution of *Bolitoglossa dofleini* is poorly documented in Belize, and the species is considered rare in the Yucatan Peninsula (Lee, 2000). McCoy (1990) reported a single specimen from Cayo District (CM 112124), the only one referenced in Lee (1996). This species also is known from the Columbia River Forest Reserve in Toledo District (Meerman and Lee, 2003), as noted in Stafford et al. (2010). This voucher represents the first verified record of *B. dofleini* in Stann Creek, extending the known range ca. 65 km (airline distance) to the NE from the locality of CM 112124 (McCoy, 1990) and ca. 92 km (airline distance) to the NE from the Toledo District locality.

**Reptilia: Squamata**

**Family Dipsadidae**

*Ninia diademata* Baird and Girard, 1853. BELIZE: STANN CREEK: Stann Creek West Constituency, Toucan Ridge Ecology and Education Society field station, near Middlesex (17.050500°N, 88.567430°W; WGS 84); elev. 192 m; Russell J. Gray. Four adults (three males, one not sexed) were found in an overgrown orchard near evergreen broadleaf forest. One adult male found on 2 September 2016 (SDSNH_HerpPC_05347–9; Fig. 2) was digitally vouchered.

Little is known about the distribution of *Ninia diademata* in Belize. Stafford and Meyer (2000) noted that this species occurs in “Cayo and Toledo Districts” (p. 222), and later indicated its occurrence in Stann Creek District as “#?” (p. 321), meaning “confirmed from District but specific locality(s) unknown.” Stafford et al. (2010) made no mention of potential localities in Stann Creek, and listed its distribution only as Cayo and Toledo districts. Additionally, Lee (1996; 2000) and Wallach et al. (2014) did not list this species as occurring in the country outside of Toledo. To our knowledge, only a single specimen of *N. diademata* from Belize exists (KU 157600; “2.7 mi NE of Golden Stream”, Toledo District; Lee, 1996: 343). Therefore, these vouchers represent the first records of *N. diademata* with verified localities in Stann Creek District, extending the known range of this species ca. 78 km (airline distance) to the NNE from the locality of KU 157600, and ca. 36 km (airline distance) to the NE from the Cayo District locality given by Stafford and Meyer (2000) without a reference.
Fig. 1. Dorsal (top) and frontal (bottom) views of a *Bolitoglossa dofleini* (SDSNH_HerpPC_05350, 05352) from Stann Creek District, Belize.

© Russell J. Gray

Fig. 2. An adult *Ninia diademata* (SDSNH_HerpPC_05347) from Stann Creek District, Belize.

© Russell J. Gray
Acknowledgments.—We thank the directors of Toucan Ridge Ecology and Education Society, Vanessa Kilburn and Mathieu Charette, for their support, and Bradford D. Hollingsworth for providing the photo voucher numbers. This study was carried out under Scientific Collection/Research Permit Ref. No. WL/1/1/16(48) and we thank Edgar Correa of the Belize Forestry Department for assistance obtaining the permit. Finally, we thank Louis W. Porras and Javier Sunyer for helpful comments on the manuscript.

Literature Cited


Russell J. Gray1 and Erich P. Hofmann2

1Toucan Ridge Ecology & Education Society, 27.5 Hummingbird Highway, Stann Creek District, Belize.
E-mail: russell_graypt@yahoo.com

2Indiana University of Pennsylvania, Department of Biology, 975 Oakland Avenue, Indiana, Pennsylvania 15705-1081, United States. E-mail: e.p.hofmann@iup.edu (Corresponding author)
Verified distribution records and prey items of *Isthmura bellii* (Gray, 1850)  
(Caudata: Plethodontidae) in Jalisco, Mexico

Bell’s False Brook Salamander, *Isthmura bellii* (Gray, 1850), formerly in the genus *Pseudoeurycea* (see Rovito et al., 2015), is a species endemic to Mexico that inhabits pine and pine-oak forests at high elevations (Parra-Olea et al., 2005). This species is considered as threatened by Mexican law NOM-059-2010 (SEMARNAT, 2010), and has been assessed as Vulnerable in the IUCN Red List of Threatened Species (IUCN, 2016). Herein, we present two verified distribution records from western Jalisco, Mexico, and report on prey items found in the stomach contents of one individual.

An individual of *I. bellii* was found on 20 June 2016, on the road to Barrio de Las Garrapatas, Municipio de San Sebastián del Oeste, San Sebastián (20°45'39.96"N, -104°51'15.32"W; datum WGS 84); elev. 1,415 m; Raúl Bernal-Contreras. On June 21 2016, another *I. bellii* was found at San Sebastián, Calle La Pareja (20°45'43.62"N, -104°51'34.09"W; datum WGS 84); elev. 1,417 m; Miguel Ángel Lepe-Sánchez. Both salamanders were encountered and photographed during the rainy season. Photo vouchers were deposited at the University of Texas at El Paso Biodiversity Digital Collection. The vegetation in the vicinity of San Sebastián is dominated by pines (*Pinus* sp.) and patches of cloud forest. The first animal (UETP G-2017.16) was observed near a house on a street made of rocks (Fig. 1A), and the second (UETP G-2017.17) was found dead on a sidewalk under a Shamel Ash (*Fraxinus uhdet*), near a coffee plantation (Fig. 1B). The dead specimen was an adult male measuring 94.73 mm in snout–vent length and 189.57 mm in total length. This specimen (specimen number not assigned) was deposited in the Collection of the Instituto de Biología, Estación de Biología de Chamela (EBCH), Universidad Nacional Autónoma de México (UNAM).

Although the occurrence of *I. bellii* in Nayarit (north of San Sebastián, Jalisco) has been discussed recently (Luja et al., 2014; Woolrich-Piña et al., 2016), collecting or georeferencing data from Nayarit were not provided. Luja et al. (2014: 1,139) mentioned nearby records of *I. bellii* in San Sebastián del Oeste, but did not provide additional information. Our observations, therefore, are the first verified records of *I. bellii* in the municipality of San Sebastián del Oeste, Jalisco (Fig. 2). Our observations also extend the distribution of this species ca. 162 km SW (airline distance) from the nearest locality in Jalisco, at Sierra de los Huicholes, 29 km NW of Bolaños on the road to Huejuquilla and ca. 26 km S (airline distance) from Nayarit (Jalisco–Nayarit border; Ahumada-Carrillo et al. 2014; Woolrich-Piña et al. 2016). These records of *I. bellii* represent the closest records to the Pacific coast ca. 42 km W (airline distance) from Bahía de Banderas, Jalisco–Nayarit (shared by the municipality of Bahía de Banderas in Nayarit and the municipalities of Puerto Vallarta and Cabo Corrientes in Jalisco).

Canseco-Márquez and Gutiérrez-Mayén, (2010) indicated a varied diet for *I. bellii*, including insects (Hemiptera: Lygaeidae and Coreidae), adult beetles (Coleoptera: Tenebrionidae and Chrysomelidae), larvae (Coleoptera: Tenebrionidae), parasitic Hymenoptera, Lepidoptera larvae (Pyralidae), insect eggs, pillbugs (Crustacea: Isopoda), millipedes (Diplopoda), and spiders (Arachnida: Araneae). We conducted a stomach content analysis of the dead salamander and found the following prey items: Cosmatidae (Opiliones), *Oxidus gracilis* (Koach, 1847), (Diplopoidea: Polydesmidia: Paradoxosomatidae), Raphidophoridae (Orthoptera), and Philonthina (Coleoptera: Staphylinoidea: Staphylininae) (Fig. 3). Our analysis revealed new orders and families of arthropods as part of diet of *I. bellii*. 
Fig. 1. Individuals of *Isthmura bellii* from San Sebastián, Municipio de San Sebastián del Oeste, Jalisco. (A) UTEP G-2017.16, photographed 20 June 2016; and (B); UTEP G-2017.17, photographed 21 June 2016. © Raúl Bernal-Contreras (A) and Miguel Ángel Lepe-Sánchez (B)

Fig. 2. Map indicating the new localities for *Isthmura bellii* from San Sebastián, Municipio de San Sebastián del Oeste, Jalisco, Mexico.
Fig. 3. Stomach contents found in a specimen of *Isthmura bellii* (specimen number not assigned) (A) Order Opiliones, family Cosmetidae; (B) a diplosegment of the millipede *Oxidus gracilis*; (C) the abdomen, head, and femur of hind leg of an orthopteran, family Raphidophoridae; and (D) a beetle, family Staphylinidae, subtribe Philonthina. Scale bar 1 mm.

© Fabio Germán Cupul-Magaña

**Acknowledgments.**—We thank Raúl Bernal-Contreras and Miguel Ángel Lepe-Sánchez for providing the specimen and the photographic material, José Luis Navarrete-Heredia for corroborating the identification of the Staphylinidae, Jesús Alberto Cruz-López for corroborating the identification of the Cosmetidae, and Armando H. Escobedo-Galvan for comments that improved this note. We also thank Martha G. Arroyo-Joya for allowing us to use the facilities at Laboratorio de Ciencias Básicas, Centro Universitario de la Costa, Universidad de Guadalajara and Arthus Harris for providing the photo voucher numbers. We collected the specimen under permit SEMARNAT FAUT-0064.

**Literature Cited**


Morphological variation in *Abronia reidi* (Squamata: Anguidae) with comments on distribution

Many herpetofaunal species in Mesoamerica are known to science from few specimens, and hence their morphological variation remains poorly characterized (Bezy and Camarillo R., 2002; Wilson and Townsend, 2007; Mendelson III et al., 2015; Wilson and Mata-Silva, 2015; Kubicki, 2016). The lack of comparative material in such taxa typically is due to a combination of restricted geographic range and secretive natural history (Caviedes-Solis et al., 2015; Wallach, 2016), often compounded by their occupancy of difficult-to-sample habitats, such as forest canopies (Mendelson III et al., 2015). Arboreal alligator lizards in the genus *Abronia* exemplify these patterns (Campbell and Frost, 1993; Bille, 2001). Encompassing 29 described species, this genus ranges from Mexico through Guatemala and into parts of Honduras and El Salvador. Generally, *Abronia* are forest-canopy specialists distributed allopatrically across highland regions. Six morphologically and genetically diagnosable clades are recognized within the genus (Campbell and Frost, 1993; Bille, 2001). Comprising 29 described species, this genus ranges from Mexico through Guatemala and into parts of Honduras and El Salvador. Generally, *Abronia* are forest-canopy specialists distributed allopatrically across highland regions. Six morphologically and genetically diagnosable clades are recognized within the genus (Campbell and Frost, 1993; Bille, 2001).

**Morphological variation in *Abronia reidi* (Squamata: Anguidae)**

Cumulatively, *Abaculabronia* is known to science from only nine specimens. *Abronia ornelasi* was last reported in 1980 and is known from the holotype and six paratypes, with only one female represented. All were taken at elevations from 1,500 to 1,600 m on Cerro Baúl, in the Chimalapas highlands of Oaxaca and Chiapas, Mexico (Campbell, 1984). Scientists last documented *A. reidi* in 1954. This species is known from just two specimens, the adult male holotype and a juvenile female paratype, both from an elevation of 1,635 m on the crater rim of Volcán San Martín Tuxtla, in the Sierra de Los Tuxtlas of Veracruz, Mexico (Werler and Shannon, 1961).

Here, we describe morphological variation from two additional *A. reidi*, based on voucher photographs deposited at the Natural History Museum of Los Angeles County (LACM PC; the PC indicates Photo Collection). Together, these two individuals revise our concept of the species’ diagnostic traits, and narrow the morphological divergence separating *A. reidi* from *A. ornelasi*. Our new material also expands the known distribution of *A. reidi* within the Sierra de Los Tuxtlas.
Our two new *A. reidi* were temporarily made available to one of us (PH) for photography in the early 2000s by a resident of La Victoria, Municipio de Catemaco, Veracruz. One of these (LACM PC 2105–2107) was a live adult male (Fig. 1). We analyze this male here for the first time, but it previously was mentioned in the literature (Heimes, 2002; Zaldívar Riverón et al., 2002). This male was collected along with a live adult female when the pair reportedly fell from a tree while mating, along a dirt road at an elevation of 1,000–1,200 m on the slopes of the Santa Marta area, Sierra de Los Tuxtlas. We do not report on this female further, due to lack of suitable photographic documentation. The second individual we studied (LACM PC 2105–2107) was a road-killed adult male (Fig. 2) from an undisclosed location on the slopes of Volcán Santa Marta, Sierra de Los Tuxtlas. The eventual disposition of these three individuals is unknown, but we presume them to be lost. In reporting these individuals, we follow the scale terminology of Bogert and Porter (1967) and scale count protocols from Campbell (1982). For bilateral head scales, we recorded counts on both sides, expressed herein as “right/left.”

*Abaculabronia* are differentiated from all other *Abronia* subgenera by the following combination of eight characters, as described by Campbell and Frost (1993): (1) frequent prefrontal-anterior superciliary scale contact; (2) absence of expanded lower temporal scales; (3) three primary temporal scales in contact with the postocular scales; (4) absence of “protuberant head shields” on the posterolateral corners of the head; (5) absence of protuberant supra-auricular scales; (6) fewer than eight longitudinal nuchal scale rows; (7) fewer than 38 transverse dorsal scale rows; and (8) lateral-most rows of ventral scales expanded. Although we could not verify the condition of the first and last characters in our new material, all of their other diagnostic features conform to *Abaculabronia*, and this combination of features is not found within any other clade.

Traditionally, *A. reidi* has been distinguished morphologically from *A. ornelasi* based on four characters of lepidosis. In *A. reidi*, these characters are as follows (condition of *A. ornelasi* in parentheses): absence of frontonasal-frontal scale contact (present in *A. ornelasi*); three temporal scales (four); parietal scale in contact with median supraoculars (no contact); and 34–36 transverse dorsal scale rows (30–33). In this contribution, we reexamine these characters to revise our concept of the species’ diagnostic characters. We present the relevant character data in Table 1.

![Fig. 1. A live adult male *Abronia reidi* from the slopes of Volcán San Martín, Sierra de Los Tuxtlas (LACM PC 2105–2107), illustrating the diagnostic lepidosis characters. The difference in color between these two images, which illustrate the same animal, could be attributed to the process of digitally scanning the photographic slides and/or because these photos were taken several months apart.](image-url)
Our new material indicates that *A. reidi* and *A. ornelasi* are not as morphologically divergent as once thought. Only one of the four scale characters traditionally used to separate *A. reidi* and *A. ornelasi* can still be considered diagnostically informative: number of transverse dorsal scale rows (Table 1.). All of the remaining characters we examined were inconsistent with what previously were considered to be diagnostic characteristics between the two species. The idea that our new material is simply misidentified *A. ornelasi* is precluded by the preponderance of character data available for our specimens.

These results are consistent with recent findings, in congeners, of similar variation in supposedly diagnostic morphological traits (Bille, 2001; Clause et al., 2016b). In particular, the variation in anterior temporal scale number and in frontonasal-frontal scale contact from our study mirrors findings from those previous studies, indicating that these characters are far more labile than previously believed. Thus, we conclude that the diagnostic importance traditionally allocated to cranial lepidosis characters in *Abronia* might have been misplaced.

Similar to recent revelations that *Abronia chizsari* is widespread across the Sierra de Los Tuxtlas (Clause et al., 2016b), here we show that *A. reidi* is not limited solely to Volcán San Martín, contrary to past suppositions (Werler and Shannon, 1961; Smith and Smith, 1981). Furthermore, *A. reidi* appears to occur at a much broader...
elevational band, from 1,635 m down to as low as 1,000 m. This suggests that *A. reidi* and *A. chizari* might occur in syntopy in parts of the Sierra de Los Tuxtlas, which would contribute to a growing list of *Abronia* taxa that are not allopatric to all congeners, as previously believed (Torres et al., 2013; Clause et al., 2016b).

Although we show that *A. reidi* and *A. ornelasi* display limited morphological divergence, they are nonetheless quite isolated from one another biogeographically. They exist on opposite sides of the Isthmus of Tehuantepec, a known biogeographic barrier for numerous herpetofaunal species (Campbell, 1984). Furthermore, they are geographically separated by over 100 km of inhospitable lowland habitat in the Gulf Coastal Plain. Unfortunately, no DNA samples exist for *A. reidi*, so we cannot compare levels of genetic divergence between it and *A. ornelasi*. Pending genetic analysis, we refrain from advocating for the synonymization of these two species.

As argued elsewhere (Clause et al., 2016a), the collection of whole-body specimens and tissue samples in addition to photos is a vitally important best-practice for researchers who document biodiversity. Despite numerous trips and hundreds of person-hours we and others have spent searching for *A. reidi* in the Sierra de Los Tuxtlas over the past 12 years, no new material has been forthcoming. As such, we deemed it prudent to release this photo-based information in the hope that it will stimulate additional survey efforts for this enigmatic species.

**Acknowledgments.**—We thank Santos Rodriguez Leal for permission to photograph the *A. reidi* in his care, and Neftali Camacho at the LACM for graciously accessioning our photo vouchers. Financial support provided by a University of Georgia Presidential Fellowship and a State of Georgia Hope Scholarship. We also thank Angela Burrow, Erin Cork, and Micah Miles for reviewing and offering comments on an earlier draft of this manuscript.

**Literature Cited**


Additional information on the natural history of *Anolis cusuco* (Squamata: Dactyloidae)

*Anolis (Norops) cusuco* (McCranie, Köhler, and Wilson, 2000) is a poorly studied species of Neotropical anole that once was believed endemic to the vicinity of its type locality: Parque Nacional El Cusuco Centro de Visitantes... Departamento de Cortés, Honduras. Since that time additional localities in northwestern Honduras have been reported, in the departments of Copan, Cortés, and Santa Barbara, including in Parque Nacional Cerro Azul (Townsend and Wilson, 2008; McCranie and Köhler 2015). McCranie and Köhler (2015) indicated that no information is available on the diet or reproduction of this species.

This note represents a substantial increase to the natural history of *A. cusuco*. We observed all agonistic and reproductive interactions in and around the vicinity of the type locality: the park’s visitor center (Centro de Visitantes La Naturaleza)/ Operation Wallacea Base Camp (15.49641°N, 88.21186°W; WGS 84); elev. 1,575 m. The visitor center/ base camp is located in a man-made clearing within a high elevation mixed coniferous and broadleaf forest. During the time of our observations, this clearing was heavily trafficked and disturbed. We also documented all observations involving predatory behavior in the surrounding forest, within about a 100 m radius of this location. This anole is locally abundant in this region of the park, where we observed a consistently dense population despite periodic high levels of anthropogenic disturbance. Based on our observations across a 4-year period, the population of *A. cusuco* in this locality appears to be stable.

**Territorial Behavior**

On 15 June 2015 at 1430 h, we observed two adult male *Anolis (Norops) cusuco* engaging in an agonistic interaction on a tree stump ca. 20 m from the nearest forest edge, within the clearing surrounding the visitor center. The two individuals faced off with their dewlaps extended; one showed an erected nuchal crest and dorsal ridge, but both characteristics subsided ca. 15 min after capture (Fig. 1).
On 27 July 2015, we observed two adult male *A. cusuco* in an agonistic interaction, with their nuchal crests and dorsal ridges raised, on a wooden pillar ca. 10 m from the previous observation. We confirmed them as different individuals from those in the previous observation by comparing their morphological characteristics. The individuals initially appeared to size each other up, and approached one another laterally while making short head-bobbing movements (Fig. 2, Stage 1). When within ca. 35 cm of one another, one male extended its dewlap and began bouncing in a “push-up” fashion while gradually edging closer, and the other male mirrored this behavior (Fig. 2, Stage 2). One male then initiated a physical confrontation, which involved both males biting each other around the jaw and head (Fig. 2, Stage 3). The individuals remained locked in conflict for roughly 5 min before we captured them for morphometric data collection.

![Fig. 1](image1.jpg) **Fig. 1.** Our initial observation showing an erected nuchal crest and dorsal ridge in a male *Anolis (Norops) cusuco* in Parque Nacional Cusuco, Honduras.

![Fig. 2](image2.jpg) **Fig. 2:** Two male *Anolis (Norops) cusuco* in an agonistic interaction. Stage 1: individuals size each other up while making short head-bobbing movements. Stage 2: the anoles extend their dewlaps and bounce in “push up” fashion. Stage 3: the anoles engage in a physical confrontation by biting each other on the head and jaw.
We also observed male *A. cusuco* appearing to maintain territories during their main periods of activity, i.e., morning and late afternoon. We witnessed multiple mature males establishing dominance by vigorously bouncing in an archetypal “push-up” motion, and intimidating, chasing, and attacking rival males while extending their dewlaps and raising their dorsal ridges and nuchal crests. The dorsal ridge was roughly 5 mm high in all observations. In some cases, the erection of a ridge and crest, combined with an extended dewlap, was enough to intimidate rivals without the need for a physical confrontation. The use of dorsal ridges and nuchal crests in these agonistic interactions is common in members of the family Dactyloidae (Williams, 1983; Köhler et al., 2015). To the best of our knowledge, this is the first record of *A. cusuco* displaying or using these structures.

**Reproduction**

On 22 March 2016 at 1530 h, we observed an adult pair of *Anolis (Norops) cusuco* copulating on the cement steps of the visitor center, ca. 20 m from the nearest forest edge. The male held onto the female by using its legs, tail, and jaws (Fig. 3A).

On 23 March 2016 at 1130 h, we observed an adult pair of *A. cusuco* copulating on the wooden exterior of the visitor center (Fig 3B). The male in this observation appeared to be different from the one in the previous observation, based on its dorsal pattern; however, we were unable to determine whether the female was different in both mating events.

To the best of our knowledge, these are the first recorded observations of mating in this species. No egg-laying sites or eggs have been described for *A. cusuco*.

One of us (TWB) has conducted fieldwork in Parque Nacional Cusuco from June to August on four successive years (2013–2016), and no additional mating events were observed during this time. This information suggests that mating is not continuous throughout the year, but likely is temporally restricted. We cannot estimate the exact beginning or end of the mating season for *A. cusuco* at this time, as neither of us has been in the park from September to February or from April to May.

---

**Fig. 3.** Observations of *Anolis (Norops) cusuco* mating. (A) On the concrete steps, and (B) on the wooden wall of the visitor center.

© Justin K. Clause
Diet

On 17 June 2015 1340, we observed a female *Anolis (Norops) cusuco* preying on an unknown species of stick insect (Phasmatodea) (Fig. 4). The observation occurred within a small garden, ca. 25 m from the nearest forest edge, within the clearing surrounding the visitor center. In addition, from June through August 2015 we observed *A. cusuco* preying several other species of small insects, including spiders and crickets. In all of our predatory observations, movements by the insects triggered the feeding response by *A. cusuco*, suggesting that this species primarily is an opportunistic predator of invertebrates. Our nearby presence, however, might have caused the lizards to cease active foraging behavior to avoid detection. We were unable to find any published information on the diet of *A. cusuco*.

Acknowledgments.—We thank Operation Wallacea for the financial and logistical support that made these observations possible. We also are especially grateful to Daisy F. Mayron and Ruth Shepherd for their invaluable contributions, and for the use of Ruth’s excellent photographs.

Literature Cited


**Justin K. Clause**¹ and **Tom W. Brown**²

¹2072 Dewberry Ct., Westlake Village, California, 91361, United States. Email: justinclause1@gmail.com

²Wallacea, Hope House, Old Bolingbroke, Lincolnshire PE23 4EX, United Kingdom. Email: browntb@outlook.com
Use of backpack radio-transmitters on lizards of the genus *Aspidocelis* (Squamata: Teiidae)

Radio-transmitters are used widely in field studies when tracking animals under natural conditions, especially when the spatial or temporal location of individuals provides information for behavioral studies and the weight of the transmitters has minimal adverse effects on their behavior. Radio telemetry has been used in ecological studies in lizards (e.g., Richmond, 1998; Warner et al., 2006; García-Bastida et al., 2012) and various methods have been proposed for securing the radio-transmitters (e.g., Fisher and Mut, 1995; Goodman, 2005; Goodman et al., 2009); not all methods, however, are suitable for the different sizes, shapes, or habits of the lizards under study.

Lizards of the genus *Aspidoscelis* are slender, highly active, and agile, so the use of external equipment that is too heavy can compromise their activity and survival. For example, species in this genus usually seek refuge among rocks and holes in the ground, and the addition of an object strapped to their body might limit their mobility to enter or leave the shelters. Moreover, during annual periods of inactivity these lizards become fossorial in their habits, and therefore require the use of some lightweight material for attaching an external transmitter.

Herein we describe a simple, inexpensive, and lightweight material that can be used for attaching an external radio-transmitter for telemetry field studies on lizards. This method involves a modification of that proposed by Gerner (2008) for the gecko *Phelsuma guentheri*, and is based on the use of a simple backpack, of low cost and high reliability, in which light-weight material is used. The placement of the backpack on the lizards apparently did not interfere with their normal behavior, such as foraging, the use of shelters, or mobility. In our original study, we monitored the use of shelter sites in *Aspidoscelis* spp.

**Methods**

From April to August 2015, we tracked four male *Aspidoscelis* sp. (mean body mass = 43.8 g; mean snout–vent length (SVL) = 118.4 mm; Table 1), near Tonatico, Estado de México, Mexico. The material used to make the backpacks consisted of a black latex band (SYRVET® syrflex cohesive starting line technology) made of a soft and elastic material, and manufactured for veterinary use. A commercial roll measuring 4,570 mm (length) × 100 mm (width) provides enough material for 45 backpacks. We cut the band into squares (100 mm × 100 mm), and later each square was cut into an X shape, which left four arms (70 mm × 10 mm) wide and four inner triangles (80 mm); we cut off and discarded three of the triangles, but one triangle was not removed (Fig. 1); we then made two cuts of 50 mm in this triangle and folded it twice (Fig. 1), adhering each fold with cyanoacrylate glue. This place is where the radio-transmitter attaches to the backpack, with the X-shaped arms used as straps on the back of the lizard. The radio-transmitter (Telenax® TCX-007BR, 5-month battery, weight 2 g, 216mHz) is positioned so that the antenna runs along the body from the top (Fig. 2). On average, the equipment (backpack and radio-transmitter) weighed 3.12 g (Table 1).

![Fig. 1. The design and assembly of the backpack, with the attached radio-transmitter VHF, for use in telemetry studies.](image)

© Marcela Martínez-Haro
Table 1: Measurements of lizards of the genus *Aspidoscelis* and weight of the backpack and radio-transmitter.

<table>
<thead>
<tr>
<th>Lizards</th>
<th>Equipment</th>
<th>% (Lizard Body Mass/Total Weight of Equipment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVL (mm)</td>
<td>Body Mass (g)</td>
<td>Backpack Weight (g)</td>
</tr>
<tr>
<td>122.77</td>
<td>48</td>
<td>0.674</td>
</tr>
<tr>
<td>122.53</td>
<td>54</td>
<td>0.692</td>
</tr>
<tr>
<td>110.45</td>
<td>27.37</td>
<td>0.642</td>
</tr>
<tr>
<td>117.93</td>
<td>46</td>
<td>0.656</td>
</tr>
</tbody>
</table>

We placed the backpack around the around a lizard’s neck, which left the transmitter on the upper part of the body, with one set of straps anterior to the arms and the other set posterior to the arms and on the upper part of the body (Fig. 2), where the straps can stick in velcro form. When necessary we shortened the straps of the backpack with scissors, and then applied a drop of glue on the straps to prevent the backpack from shifting on the back of the lizard. We did not place any glue directly on the lizard.

![Fig. 2. The backpack used to secure the VHF radio-transmitters in lizards of the genus *Aspidoscelis*.](image)

Because *Aspidoscelis* are extremely active lizards and appear to be easily stressed, it helps to use two people to place the backpack on a lizard: one to hold the lizard and another for the placement of the backpack. This process lasts about 10 min, whereas removing the backpack only requires cutting the straps, so it can only be done once.

After releasing the lizards, we monitored them daily for seven consecutive days to assess their behavior. We attempted to find any qualitative evidence of rejection, discomfort, or negative effect on the mobility of the lizard, which might be associated with the use of backpack-transmitter. We monitored and evaluated the functionality of the backpack during observational intervals that lasted 1 hr. Previously we had made such observations to locate the areas inhabited by these lizards and their places of refuge, and then continued with the telemetric studies weekly for four weeks.
Results

We used the equipment (backpack and radio-transmitter) in four adult lizards for four weeks. During this time, the backpacks we assembled were resistant to sun exposure and moisture. The overall weight of the equipment averaged 3.12 g (Table 1). Three backpacks remained attached to the lizards, but one backpack (with the radio-transmitter) was located inside of a hole used as temporary shelter. The backpack likely had fallen off the lizard because it was not adjusted properly.

None of the four lizards showed any apparent behavior patterns resulting from the placement of the backpacks, and we did not encounter any lizards entangled in vegetation or where they might not be able to access their places of refuge. We also did not find evidence of degradation in health in the lizards, and none died during four weeks of tracking.

Discussion

Although we followed the design of the backpack described by Gerner (2008), we modified it by changing the material, and we also used certain characteristics proposed by other authors (Warner et al., 2006; Goodman et al., 2009; Price-Rees and Shine, 2011; García-Bastida et al., 2012), because they provided some advantages. For example, we used a latex band; a durable material designed for veterinary use, because it is permeable and lighter in weight than other materials, and also is inexpensive. When stretched, the latex band adapted to the body of the lizards, allowing them to move freely.

The use of the backpack on the lizards showed no apparent adverse effects on their behavior, as they exhibited such habitual behaviors as escaping, searching for shelter, and foraging. The use of the backpack transmitter was necessary for locating overwintering sites and areas of shelter in Aspidoscelis, because like in many reptile species these lizards are difficult to locate on account of their elusiveness (Goodman et al., 2000). With use of the backpack we were able to locate two hibernation sites for Aspidoscelis. Our proposed backpack radio-transmitter could be used for other purposes involving telemetry, whereas the design easily can be easily adapted to other lizard species that are different from Aspidoscelis in body size, habits, and ecology.

Acknowledgments.—We thank Idea Wild for providing the financial equipment for the fieldwork, Yuriana Gómez-Ortíz, Hublester Domínguez-Vega, Leroy Soria-Díaz for assistance and comments, Ruthe Smith for comments and corrections on the manuscript, and Marcela Martínez-Haro for the photographs. This work was conducted through a scholarship by CONACYT awarded to Víctor Mundo-Hernández.

Literature Cited


A new locality for *Ctenosaura pectinata* (Wiegmann, 1834) (Squamata: Iguanidae) in central Mexico, with implications for its conservation

The natural distribution of spiny-tailed iguanas (genus *Ctenosaura*), which includes 18 species, is exclusive to Mesoamerica and extends from Mexico to Panama (Köhler, 2002; Buckley et al., 2016). The Black Spiny-tailed Iguana (*C. pectinata*) is an oviparous lizard endemic to Mexico, with a broad distribution extending along the Pacific coast from Sinaloa through Chiapas, including the Río Balsas Basin in central Mexico and two islands in the Pacific Ocean (Köhler, 2002); this species also has been introduced into Texas and Florida, in the United States (Kraus, 2009). The state of Michoacán is a major center of herpetofaunal diversity in Mexico, in which three species of iguanids occur: *Iguana iguana*, *C. clarki*, and *C. pectinata*; the latter species occurs in three physiographic regions: Coastal Plain, Balsas-Tepalcatepec Depression, and Sierra Madre del Sur (Alvarado-Díaz et al., 2013).

According to Mexican law, *C. pectinata* currently is considered threatened (SEMARNAT, 2010), and is categorized as a priority species for conservation (SEMARNAT, 2014); in Michoacán it also was assessed an Environmental Vulnerability Score (EVS) of 15, placing it in the lower portion of the high vulnerability category (Alvarado-Díaz et al., 2013). Genetic and morphological evidence suggests high variation throughout its distributional range (Zarza et al., 2008, 2016). Also, due to multiple uses for this species in rural communities (e.g., as food, pets, medicinal practices, and handicrafts), this iguanid is both culturally and economically important, resulting in many conservation challenges (Zarza et al., 2016).

During a herpetological survey, on 17 September 2016 at 1435 h, at Mesas de Enandio, Municipio de Zitácuaro, Michoacán, Mexico (19.34975°N, -100.454194°W; WGS 84; elev. 1,429 m; Fig. 1), we captured an adult male *C. pectinata* (345 mm snout–vent length, 634 mm tail length). The individual was photographed (Colección Fotográfica de Herpetología, Facultad de Ciencias, Universidad Autónoma del Estado de México, Photo Voucher CFH 13; Fig. 2) and released. The iguana was found perched on a log in an area of tropical dry forest that also contained an abundance of guava crops.

To our knowledge, the nearest previously recorded localities for this species are 92.6 km (airline distance) to the S in Huetamo, Michoacán (Reyna-Alvarez et al., 2010), and 27.3 km (airline distance) to the SE in Santo Tomás de los Plátanos, Estado de México (Köhler, 2002). Our record is significant because (1) it establishes needed locality information for this species of concern, as outlined by Buckley et al. (2016); (2) it represents a new municipality record for Michoacán; (3) this new locality presently is not included in its known geographic distribution (Köhler, 2002), including the predicted distribution for *C. pectinata* (Buckley et al., 2016); (4) it represents the most inland record for *C. pectinata* in central Mexico, including the state of Michoacán (Köhler, 2002); and (5) peripheral and newly discovered populations might show exclusive phenotypic traits that makes them valuable for conservation (Lesica and Allendorf, 1995).
Fig. 1. Map showing a new locality (star) for *Ctenosaura pectinata* at Mesas de Enandio, Municipio de Zitácuaro, Michoacán, Mexico. The squares represent the nearest previously recorded localities.

Fig. 2. An adult male *Ctenosaura pectinata* (Photo voucher CFH13) found on September 17, 2016 during a survey at Mesas de Enandio, Municipio de Zitácuaro, Michoacán, Mexico. © Oswaldo Hernández-Gallegos
Acknowledgments.—We thank Ildefonso Andrade-Gutiérrez for his valuable field assistance, and Luis Canseco-Márquez for verifying the identification of the species. The scientific collector permit was SEMARNAT FAUT 0186.

Literature Cited


Gabriel Andrade-Soto1, Ailed Pérez-Pérez1, Ana Esthela López-Moreno1, Gabriel Suárez-Varón1, Orlando Suárez-Rodriguez1, Kevin Michael Gribbins2, and Oswaldo Hernández-Gallegos1

1Laboratorio de Herpetología, Facultad de Ciencias, Universidad Autónoma del Estado de México, Instituto Literario 100, Toluca Centro, C. P. 50000, Estado de México, Mexico. E-mail: bioherpetologia.22@gmail.com (GAS, Corresponding author)

2Department of Biology, University of Indianapolis, 1400 E. Hanna Ave., Indianapolis, Indiana 46227, United States.

New records, distributional range, and notes on Marisora brachypoda (Squamata: Mabuyidae) in Mexico

The Middle American Short-limbed Skink, Marisora brachypoda (Taylor, 1956), formerly in the synonymy of Mabuya unimarginata (for a taxonomic review see Hedges and Conn, 2012), is a poorly known species that generally is considered rare, although it can be locally abundant. Chaves. (2013) provided general information on the habitat of this species, whose conservation status has been assessed as Least Concern by IUCN. The evidence suggests that M. brachypoda represents a species complex throughout its wide distribution, which comprises Nicaragua, Costa Rica, Honduras, El Salvador, Guatemala, Belize, and Mexico (Hedges and Conn, 2012). In Mexico, the available locality records for this species are dispersed throughout the literature and in herpetological collections (Hedges and Conn, 2012). In Mexico, the known distribution of M. brachypoda extends from Veracruz and northern...
Nayarit south to the Belize and Guatemala borders; however, there is no a clear distribution pattern for this species (e.g., Ochoa-Ochoa, 2006; Chaves et al., 2013).

Marisora brachypoda is a viviparous, diurnal, terrestrial skink that has been reported in herpetofauna checklists and other publications on the Mexican states of Chiapas (Johnson et al., 2015), Colima (Duellman, 1958), Guerrero (Pérez-Ramos et al., 2000), Jalisco (García and Ceballos, 1994), Michoacán (Alvarado-Díaz et al., 2013), Morelos (Castro-Franco and Bustos-Zagal, 1994), Nayarit (Casas-Andreu, 1992; Woolrich-Piña et al., 2016), Oaxaca (Casas-Andreu et al., 1996; Castro-Gálvez, 2011), Puebla (García-Vázquez et al., 2006), Veracruz (Pelcastre-Villafuerte and Flores-Villela, 1992; Aguilar-López and Canseco-Márquez, 2006; Chavez-Lugo, 2015), and the Yucatan Peninsula (Lee, 1996; Köhler, 2003, Calderón-Mandujano et al., 2008); many of these publications, however, do not provide specific localities. In addition, few published records are available, such as in Estado de México (Macip-Ríos et al., 2012), Quintana Roo (Calderón-Mandujado and Mora-Tembre, 2004; Luja, 2006), Tabasco (Hernández-Franyutti and Uribe, 2012), and Campeche (Burger, 1952). For this reason, herein we cite most of the available distributional information for M. brachypoda in Mexico, including new locality records resulting from fieldwork, in order to identify and analyze any patterns. We also include a distribution map of M. brachypoda, as well as a map on its potential sites of occurrence.

Geographic data for M. brachypoda were obtained from the following sources: Global Biodiversity Information Facility (GBIF, 2016; www.gbif.org); Colección Nacional de Anfibios y Reptiles of the Instituto de Biología, Universidad Nacional Autónoma de México (CNAR-UNAM); Museo de Zoología Alfonso L. Herrera of the Facultad de Ciencias (MZFC-UNAM); Laboratorio Integral de Fauna Silvestre of the Universidad Autónoma de Guerrero (LIFAS-UAGro); University of Illinois Museum of Natural History Amphibian and Reptile Collection (UIMNH); California Academy of Science Herpetology Collection (CAS); University of California, Berkeley, Museum of Vertebrate Zoology (MVZ); specialized literature, and from our field sampling. To compile the database to generate the distribution model, we removed points with uncertain or indeterminate locality or inaccurate identification information. We georeferenced all of the localities without geographical information to the nearest minute of latitude and longitude, after consulting a series of maps. We compiled all the localities into a geographical information system (GIS) to identify and analyze patterns in the previous distribution of M. brachypoda for aid in generating a revised distribution model. The data set consisted of 162 records, representing 153 different distribution points. We used Maxent (version 3.3.3k; Phillips et al., 2006) to generate a species distribution model (SDM). This algorithm combines presence points and raster layers to calculate the environmental niche of the species determining the probable distribution based on maximum entropy (Phillips et al., 2006). This niche modeling approach has been used in several studies to predict species distributions (Elith et al., 2011). Based on our objective to determine the geographic distribution, we used Mexico and Central America (from latitude 9.5° to 25°) as an environmental background (M) following the BAM diagram proposed by Soberón and Peterson (2005). We included all records of M. brachypoda and environmental layers from Worldclim (bio1-bio19; www.worldclim.org) and topographic data (elevation, aspect, and slope; http://eros.usgs.gov/), all in ~1 km² resolution (Hijmans et al., 2005). We used the default parameters of Maxent and 80% of the initial records to create a training model and the remaining 20% to assess the accuracy of the models. We used the receiver operating characteristic curve (ROC) to examine model performance calculating the area under the receiver operating curve (AUC), which measures the ability of a model to discriminate between sites where a species is present or absent (Phillips et al., 2006). We ran five replicates using the bootstrap algorithm and 1,500 iterations with random seed (permitting the initial conditions to change for each run), using the minimum training presence as a threshold value. Finally, we selected the consensus model produced by replicates as the proposed geographic distribution for M. brachypoda.

We show the distribution records for M. brachypoda in Mexico in Figure 1 and present the new records in Table 1. Our new photographic records of M. brachypoda were collected between 2014 and 2016 and added to the CNAR-UNAM (IBH-RF 408[a-d]-414), MZFC-UNAM (31316), and LIFAS-UAGro (1520,1521,1586). Marisora brachypoda occurs on both the mainland and islands in the Pacific Ocean and the Gulf of Mexico. This species has been recorded at elevations from sea level to 2,192 m. At low and moderate elevations (0–1,200 m), this species occurs mainly in tropical deciduous forest (TDF) and thorn forest (Fig. 2 E, F), although at higher elevations (>1,200 m), for example in central Guerrero, the vegetation corresponds to oak forest or oak woodland with patches of grassland and scrub with Agave spp. and herbaceous plants (Fig. 2 B–D).
Fig 1. Occurrence records for *Marisora brachypoda* within Mexico. Black circles denote museum, database, and literature records (*n* = 150), and red circles indicate the new records (*n* = 12). Gray scale represents the elevation. The distribution of *M. brachypoda* extends into Central America, but is not shown here.

We show the potential distribution model for *M. brachypoda* in geographical space in Figure 3. The results generated an AUC value of 0.973, implying potentially significant results. Our model corresponded closely with our general understanding of the distribution of *M. brachypoda* in Mexico and Central America. This geographic model shows previously known areas and ecosystems (TDF and oak forest) inhabited by *M. brachypoda*; however, it also reveals new areas without records that show medium–high probabilities of distribution on the Pacific and Gulf coasts of Mexico and in southern Puebla.

According to the prediction model, we found three areas out of the known distributional sites. Our model suggests that *M. brachypoda* could occur in: (a) southern Sinaloa near the northern border of Nayarit; (b) southern Tamaulipas near Veracruz; and (c) the southern mountains of Tehuacan in Puebla near Oaxaca (Fig. 3). The lack of records in these areas may be due to the secretive habits and cryptic strategies of *M. brachypoda*. The model also shows a high probability of occurrence in the Mexico/Guatemala border areas. More intensive surveys in these areas are necessary to confirm the presence of *M. brachypoda*, and thus increase the distributional information for this taxon or improve over-prediction in this model, if such is the case.
<table>
<thead>
<tr>
<th>Locality</th>
<th>Municipality</th>
<th>State</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Elevation (m)</th>
<th>Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrizal de Cinta Larga</td>
<td>Tecpan de Galeana</td>
<td>Guerrero</td>
<td>17.1634</td>
<td>-100.7333</td>
<td>9</td>
<td>Tropical deciduous forest</td>
</tr>
<tr>
<td>Rancho Jerusalen</td>
<td>Tecpan de Galeana</td>
<td>Guerrero</td>
<td>17.2177</td>
<td>-100.6142</td>
<td>32</td>
<td>Tropical deciduous forest</td>
</tr>
<tr>
<td>Parque Nacional Grutas de Cacahuamilpa</td>
<td>Pílcamay</td>
<td>Guerrero</td>
<td>18.6692</td>
<td>-99.5094</td>
<td>1,175</td>
<td>Tropical deciduous forest</td>
</tr>
<tr>
<td>1.4 km SW of La Carbonera</td>
<td>Atenango del Río</td>
<td>Guerrero</td>
<td>18.2279</td>
<td>-99.0118</td>
<td>1,229</td>
<td>Oak woodland</td>
</tr>
<tr>
<td>La Encinera, 4.5 km SW of Papalutla, road Papalutla–Xixila</td>
<td>Olinalá</td>
<td>Guerrero</td>
<td>17.9979</td>
<td>-98.8686</td>
<td>1,290</td>
<td>Oak woodland</td>
</tr>
<tr>
<td>Estación Biológica El Limón</td>
<td>Tepalcingo</td>
<td>Morelos</td>
<td>18.5425</td>
<td>-98.9359</td>
<td>1,311</td>
<td>Tropical deciduous forest</td>
</tr>
<tr>
<td>1 km NE of Xixila</td>
<td>Olinalá</td>
<td>Guerrero</td>
<td>17.9581</td>
<td>-98.8499</td>
<td>1,647</td>
<td>Oak woodland</td>
</tr>
<tr>
<td>ca. 5 km S Puerto del Balsamo</td>
<td>Coyuca de Catalán</td>
<td>Guerrero</td>
<td>17.96192</td>
<td>-101.2079</td>
<td>1,650</td>
<td>Oak woodland</td>
</tr>
<tr>
<td>1.6 km S of Xixila</td>
<td>Olinalá</td>
<td>Guerrero</td>
<td>17.9309</td>
<td>-98.8464</td>
<td>1,785</td>
<td>Oak woodland</td>
</tr>
<tr>
<td>Chilacachapa</td>
<td>Tixtla de Guerrero</td>
<td>Guerrero</td>
<td>17.5522</td>
<td>-99.2710</td>
<td>1,994</td>
<td>Oak woodland</td>
</tr>
<tr>
<td>Tenexatlajco/El Peral</td>
<td>Chilapa de Álvarez</td>
<td>Guerrero</td>
<td>17.554378</td>
<td>-99.2697</td>
<td>2,010</td>
<td>Oak woodland</td>
</tr>
</tbody>
</table>

Because a significant part of the predicted distribution area of *Marisora brachypoda* lies within TDF, it is important to consider the status of this forest. TDF is the most representative tropical ecosystem in Mexico, and occurs principally on the Pacific coast and is one of the most important biodiversity reservoirs, as it contains 33% of the terrestrial vertebrates. According to Dinerstein et al. (1995), however, the conservation status of this ecosystem in most regions is critical, and the conservation priority is high due to its biodiversity value and conservation importance. The national forest census in 2000 calculated that only 53% of the dry forest along the Pacific coast remains. The combined influences of a variety of social factors, such as deforestation, fire, and habitat fragmentation (Ceballos et al., 2010) create an annual disappearance rate of 1.1% of area per year. TDF is threatened by the effects of human activities, as well as climate change and its associated effects (Miles et al., 2006; Sotelo-Caro et al., 2015). These ecological pressures could determine the presence/absence of the species.

Finally, these findings and records have valuable applications for identifying areas of endemism, and consequently will aid the development of inclusive strategies for conserving regional endemism. More information is necessary to determine the taxonomy of *Marisora brachypoda*, which will lead to a better method for evaluating the conservation status of this species complex. Information on the natural history and ecology of this species, such as habitat and physiological requirements, thermal tolerances, periods of activity, and population dynamics, is
necessary to determine the impact of human activities on its vulnerability. The secretive habits and cryptic strategies of this organism make it difficult to find robust populations and might present a problem in determining the impact of human activities on the vulnerability of this species. All of these pressures on *M. brachypoda* and its habitat are concerning, not just for this species, but for many other reptiles that share its TDF and oak forest environments, on which modification or reduction will have important consequences on populations.

![Fig 2.](A) An individual of *Marisora brachypoda* (photo voucher IBH-RF 409); and the habitats of this species, characterized by (B) oak woodland with patches of grassland, shrubs, agaves, and herbaceous plants, (C, D) oak woodland; and (E, F) tropical deciduous forest.

© Victor H. Jiménez-Arcos (A), Rafael A. Lara-Resendiz (B, C, and D), and Esteban Amaro Mauricio (E, F)
Fig. 3. Potential geographic distribution for *Marisora brachypoda* according to Maxent, using occurrence records and considering climatic and topographic variables. Colors progressing from green to yellow to red refer to Maxent values of probability of presence, with warmer colors indicating areas with better-predicted conditions (range 0–1, logistic Maxent output). All areas with a Maxent prediction of or near 1 represent suitable environmental conditions for the species. White circles indicate occurrence records on which the models were based.

**Acknowledgments.**—We thank Parque Nacional Grutas de Cacahuamilpa (CONANP) for accommodation and facilities granted during our stay. We also thank Elizabeth Beltrán, Jesús Loc-Barragán, Diego Arenas, Itzel Florentino, Sebastian Palacios-Resendiz, and Ignacio Beltrán for providing species records and field assistance. We are pleased to acknowledge Jules Wyman for his careful review of this manuscript. The collection permit number 01629/16 was granted by the Dirección General de Vida Silvestre of México to Fausto Méndez-de la Cruz. Finally, we thank GBIF, MZFC, LIFAS-UAGro, UIMNH, CAS, MVZ, and CNAR for providing databases for analysis.

**Literature Cited**


CALDERÓN-MANDUJANO, R., H. VAHENABASAVE, AND S. CALMÉ. 2008. Guía de los Anfibios y Reptiles de la Reserva de la Biósfera de Sian Ka’an y Zonas Aledañas / Amphibians and Reptiles of the Sian Ka’an Biosphere Reserve and Surrounding Areas. COMPACT, ECOSUR, CONABIO, and SHM A.C., Reserva de la Biósfera Sian Ka’an, Quintana Roo, Mexico.


Wild and captive observations on the Burrowing Python, *Loxocemus bicolor* (Loxocemidae)

The Burrowing Python, *Loxocemus bicolor* Cope, 1861, is a secretive snake that occurs primarily in subhumid lowlands and adjacent premontane slopes along the Pacific versant from Nayarit, Mexico, to northwestern Costa Rica, and on the Atlantic versant in interior valleys in Chiapas, Mexico, Guatemala, and Honduras, at elevations from sea level to 979 m (Castro-Franco and Bustos Sagal, 1994; Savage, 2002; Solórzano, 2004; McCranie, 2011; Carbajal-Márquez et al., 2015). The total length (TL) of this snake is known to range from 700 to 1,600 mm (Alvarez del Toro, 1982; Mora and Chaves-Quiroz, 1989; Solórzano, 2004). This species preys primarily on terrestrial vertebrates, including anurans, lizards, snakes (including its own species), and rodents, as well as the eggs of turtles (including sea turtles) and iguanids (see Merchán and Mora, 2001, Savage, 2002, and Solórzano, 2004, and references therein).

The IUCN Red List of Threatened Species has assessed the conservation status of *L. bicolor* as Least Concern (Chaves et al., 2014), and Johnson et al. (2015) gauged this species with an EVS of 10, placing it in the lower portion of the medium vulnerability category. In Mexico, *L. bicolor* is classified as a species under special protection (Pr) by NOM-059 (Herrera Flores, 2010), but this assessment eventually might change as a result of continued development along the Pacific coast of the country (Meave et al., 2012). Importantly, relatively little life history information is available for this species, and the purpose of this note is to provide new observations on *L. bicolor* from the wild and in captivity.

**Wild and Captive Observations**

On 16 June 2009, one of us (SVG) found a clutch of six eggs (Fig. 1A) at Urbanización Las Garzas, Ixtapa Zihuatanejo, Municipio de Zihuatanejo de Azueta, Guerrero, Mexico (17°40'28.69"N, 101°36'9.49" W; datum WGS 84; elev. 15 m); when the clutch was discovered, the identification of the species that laid the eggs was uncertain. The eggs had been deposited in a hole under a concrete slab, and were found when the area was being cleared for development.
The eggs were removed and incubated at a temperature of 27°C and a humidity of 100%, using the same sandy substrate recovered from the nest (Fig. 1B). Nine days later, on 25 June, five eggs hatched (Fig. 1B), which confirmed the identification of the species as *L. bicolor*, and the last egg hatched two days later (Fig. 1C). The mean snout–vent length (SVL) of the six hatchlings was 330.0 ± 5.34 mm (range 320–330 mm), and their mean body mass was 22.5 ± 2.31 g (range 20–25 g) (Table 1). By 4 July all of the hatchlings had shed their skin and fed voluntarily on young mice (4 g).

![Fig. 1.](https://www.mesoamericanherpetology.org/article/fig1.png)

**Fig. 1.** (A) Empty eggshells of *Loxocemus bicolor*. The eggs were placed in the substrate in which they were found, and hatched in 5–7 days; (B) hatchlings of *L. bicolor* burrowing in the sandy substrate used for incubation; and (C) the last individual of *L. bicolor* just before emerging from the egg.

© Saraí Vázquez-González

**Table 1.** Snout–vent length (SVL) and body mass of *Loxocemus bicolor* hatchlings found in 2009 at Las Garzas Ixtapa Zihuatanejo, Municipio de Zihuatanejo de Azueta, Guerrero, Mexico.

<table>
<thead>
<tr>
<th>Number of Individual</th>
<th>Sex</th>
<th>SVL (mm)</th>
<th>Body Mass (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>320</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>330</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>330</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>330</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>H</td>
<td>330</td>
<td>25</td>
</tr>
<tr>
<td>6</td>
<td>H</td>
<td>340</td>
<td>20</td>
</tr>
<tr>
<td>Mean and SD</td>
<td></td>
<td>330.0 ± 5.34 mm</td>
<td>22.5 ± 2.31 g</td>
</tr>
</tbody>
</table>

At ca. 0600 h on 15 October 2010, at Bolsón de Santa Cruz, Provincia de Guanacaste, Costa Rica (10°22′4.45″N, 85°24′53.46″W; WGS 84; elev. 8 m), Ronny Alexander Hernández Mora and Karen Jiménez encountered two adult individuals of *L. bicolor* engaged in reproductive activity (Fig. 2). The snakes were intertwined and were observed for 16 min, up until one of the snakes, likely the male, began biting the other, but soon after the snakes dispersed in opposite directions. Interestingly, that year the seasonal rains had ceased and the level of the rivers had dropped considerably (R. Hernández Mora, pers. comm.), suggesting that the change in weather conditions perhaps triggered reproductive activity in this species. In northwestern Costa Rica and in southern Honduras, juveniles of *L. bicolor* often are encountered crossing roads in May and early June, at the beginning of the rainy season (LWP, pers. observ.; W. Lamar, pers. comm.).
Additional Observations in Captivity

Ross and Marzec (1990) reported three instances of oviposition by captive *Loxocemus bicolor*, of which one clutch contained fertile eggs. These eggs were incubated at a temperature of 32.2°C, and 79 days later the eggs were found to contain dead, deformed embryos, suggesting that they should have been incubated at a lower temperature. Subsequently, a clutch produced by a wild-mated female was laid in March. This clutch was divided into two groups, one incubated at temperatures from 27.8 to 28.9°C, and the other at 30.0 to 31.1°C. The eggs incubated at the lower temperature failed to hatch, whereas those incubated the higher temperature hatched in May. Subsequently, Odinchenko and Latyshev (1996) reported on a clutch of four eggs deposited at the Moscow Zoo, which hatched at an incubation temperature of 31°C and a relative humidity of 100%.

Two of us (SG, AG) obtained a sexual pair of *L. bicolor* in the spring of 1989, which originated in Honduras. Both animals measured ca. 1,370 mm (TL). The pair began showing reproductive behavior in 1997 (Fig. 3), and in March of 1998 the female laid 11 eggs. Prior to depositing the eggs, the female was observed rolling the lower portion of her body under a heat lamp that had been placed above the enclosure. The eggs were incubated at a temperature of 27.8°C, and 64 days later two of them hatched; one of the hatchlings, however, was noticeably underdeveloped and soon died. On 5 April 2000, the same pair copulated and the female laid six eggs, which were incubated at temperatures ranging from 31.1 to 31.7°C, and approximately 60 days later all of them hatched. In ensuing years, the pair copulated several more times, but the female never laid more fertile eggs. The male died in 2010, at which time he measured 1,550 m (TL), and after showing signs of old age, the female died in 2013.

SG and AG obtained two other females of *L. bicolor* that were born in captivity at the San Antonio Zoo in 1992, which later bred on a somewhat regular basis. Growth in both females was about equal, and in 1998, when they measured about 1,070 mm (TL), they were introduced to a male. The male showed no interest in either female, although when introduced to the enclosure of the female indicated in the previous paragraph, he immediately would start courting her. The male began showing interest in the two females in 2006, when they were over 14 years of age and measured about 1,220 mm (TL). That year each of the females produced eggs, which hatched in 60 days at the aforementioned incubation temperatures of 31.1–31.7°C. Eight more clutches (5–8 eggs) were produced during the next several years (Fig. 4), of which the earliest was deposited on 8 February and the latest on 29 March. Both of the females are still alive, and currently measure about 1,520 mm (TL).
Based on these observations and others accumulated by SG, individuals of *Loxocemus bicolor* do not appear to reach sexual maturity until they reach at least 10 years of age, individuals are still alive at the age of 25, and females are known to deposit up to 11 eggs. The above information also suggests that breeding in *L. bicolor*, at least in Costa Rica and southern Honduras, commences at the transition between the rainy and dry seasons, or early in the dry season, and hatching takes place at the end of the dry season or the beginning of the rainy season.
Acknowledgments.—We thank Luis A. Ruedas for kindly reviewing an early draft of the manuscript, and JMM thanks ICOMVIS for financial support. We also are grateful to Alexander Hernández Mora and Karen Jiménez for providing information and photographs of their observation, and Alejandro Solórzano for alerting us of this event and acting as a liaison for obtaining these data. William W. Lamar also provided information and commented on the manuscript.

Literature Cited

AlvAREz del TOro, m. 1982. Los Reptiles de Chiapas. 3rd ed. Colección Libros de Chiapas, Instituto de Historia Natural, Tuxtla Gutiérrez, Chiapas, Mexico.


