

NATURAL HISTORY NOTES

MICRURUS NIGROCINCTUS (Central American Coral Snake): CANNIBALISM. Many snake species are known to include other snakes in their diet, and New World coral snakes (*Leptomicrurus* spp., *Micruroides* sp., and *Micrurus* spp.) are well known for their ophiophagous tendencies. Approximately 75% of all coral snake species are known to feed on other snakes and about 36% are exclusively ophiophagous (Roze, 1996). Along with other snakes, the diet of coral snakes consists of other elongate ectothermic vertebrates including lizards, amphisbaenids, caecilians and fishes, as well the occasional invertebrate (Roze, 1996; Campbell & Lamar, 2004). Coral snakes also prey on congeners, even conspecifics, yet cannibalism is poorly documented within this group.

Micrurus nigrocinctus (Fig. 1) is widely distributed in several central American habitats, extending from southeastern Oaxaca, Mexico southward to northern Colombia (Savage, 2002). Like most coral snakes, *M. nigrocinctus* feeds largely on other snakes (*Adelphicos*, *Anomalepis*, *Coniophanes*, *Dendrophidion*, *Drymobius*, *Enulius*, *Geophis*, *Helminthophis*, *Imantodes*, *Leptodeira*, *Mastigodryas*, *Ninia*, *Porthidium*, *Rhadinaea*, *Tantilla*, *Typhlops*, *Tropidodipsas*, and *Urotheca*) but also eats lizards and their eggs (*Ameiva*, *Cnemidophorus*, small *Ctenosaura*, *Eumeces*, *Gymnophthalmus*, small *Iguana*, *Mabuya* and *Sphenomorphus*), caecilians, and eels (*Synbranchus marmoratus*) (Schmidt, 1932; Swanson, 1945; Landy et al., 1966; Greene & Seib, 1983; Roze, 1996; Campbell, 1998; Savage, 2002; Campbell & Lamar, 2004; Solórzano, 2004). Smith & Grant (1958) reported that a *M. nigrocinctus* collected from Panama contained another coral snake nearly equal in size but failed to mention if the snake consumed was a conspecific or another species of *Micrurus*. Here we document the first confirmed record of intraspecific cannibalism by *M. nigrocinctus* in the wild.

From 13-19 July 2008 herpetofaunal surveys were conducted in and around Reserva Natural Cerro Kilambé (Kilambé), a cloud forest reserve in north-central Nicaragua. On 19 July 2008 at 15:30 hrs an adult male *M. nigrocinctus* (Florida Museum of Natural History (UF) 155981, 56.4 cm



Figure 1. *Micrurus nigrocinctus*.

SVL, 10.4 cm TL) was collected dead on a small dirt road near the community of La Escuelita at 1075 m elevation on the northern versant of Kilambé (13°37.178'N, 85°43.399'W). The surrounding habitat was a mosaic of secondary broadleaf forest fragments and denuded areas of livestock and agricultural land. Near where UF 155981 was found a local resident told us that he killed the snake earlier that day with a machete as it crossed the road, and we found a juvenile *M. nigrocinctus* (UF 156353, 36.8 cm SVL, 4.4 cm TL) protruding from the machete wound (Fig. 2). The prey's anterior region was partially digested and the posterior end had been separated from the rest of the body (7.3 cm above the tip of the tail), yet the specimen was still easily diagnosable.

Although a few species of *Micrurus* are reportedly cannibalistic in captivity, intraspecific cannibalism has only been documented in seven species from the wild (Roze, 1996; Campbell & Lamar, 2004). Our record thus augments knowledge of the diet of *M. nigrocinctus* and increases the number of *Micrurus* species known to exhibit this uncommon behaviour. Unfortunately, the significance and prevalence of intraspecific cannibalism in coral snakes has received very little study, although several researchers have proposed explanations (Curtis, 1952; Greene, 1984; Roze, 1996). Future research on this unusual phenomenon would be a worthwhile contribution to our knowledge of the ecology and natural history of coral snakes.

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Figure 2. Dead *Micrurus nigrocinctus* with conspecific meal.

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BOTHROPS MOOJENI (Brazilian lancehead): MATING. Information about ovarian and testicular cycles is available for several neotropical species of snakes (Marques et al., 2009). However, descriptions of courtship, mating or combative behaviours are scarce and most information currently available comes from extratropical species (Sasa & Curtis, 2006). Herein we describe an observation of wild mating by *Bothrops moojeni* in nature.

B. moojeni is a large terrestrial pitviper that inhabits riparian areas in central and southeastern Brazil, including marshes, the border and interior of gallery forests and mostly areas of Cerrado (Brazilian savannah) (Nogueira et al., 2003; Campbell & Lamar, 2004; Sawaya et al., 2008).

Published literature about reproductive biology of *B. moojeni* reports a lengthy and seasonal reproductive cycle with a vitellogenic period that starts in May (mid-fall) and ovulation around July (early winter). The litter size varies from three to 32 embryos and births are concentrated during the rainy season (summer) from late December to March (Leloup, 1984; Faria & Brites, 2003; Nogueira et al., 2003; Sawaya et al., 2008). Leloup (1975) observed mating in captivity from March to May (late summer to mid-fall) and births from December to January (summer), suggesting a gestation period of about 200 days. Méier & Sandoz-Ogata (1996) observed a captive peak in reproductive activity during January. Almeida-Santos & Salomão (2002) observed UMT (uterine muscular twisting) in females under primary vitellogenesis in February and March and secondary vitellogenesis in June, suggesting sperm storage for *B. moojeni*. Although seasonal timing of mating is an important event to help characterise the reproductive cycle, we did not find any published observations of mating in *B. moojeni* in nature.

On 4 March 2009 (late summer), during a herpetofaunal survey in a forest fragment in the municipality of Patrocínio Paulista (20°38'S, 47°15'W), southeastern Brazil, two adult *B. moojeni* (male 912 mm SVL, 145 mm tail length, mass 410 g; female 977 mm SVL, 139 mm tail length, mass 550 g) were found mating at 09:20 on a cloudy day. The snakes were found mating on leaf-litter, close

to a fallen tree and temperature inside the forest was 28°C. The female was stretched and partially hidden under the fallen tree while the male was exposed on leaf-litter. No other individuals were found nearby the mating couple. Mating continued for 190 minutes before disturbance by capture. When researchers approached snakes for capture, the female reacted vibrating its tail against the ground, struck and tried to escape dragging the male behind her. The male and female ceased mating after the disturbance caused by physical restraining. Both individuals were marked (ventral scale clipping #01, male and #02, female) and released in the capture locality.

Observation of reproductive events in nature is rarely seen in neotropical snakes due to the secretive nature of many species and also because of generally low encounter rates for many species (Sasa & Curtis, 2006). The information herein contributes to the general ecological profile of the species and observations of mating behaviour in neotropical *Bothrops*. A long-term study using radio-telemetry would allow more observations of reproductive events and contribute to building a stronger database of reproductive biology for neotropical species of snakes.

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PALEOSUCHUS TRIGONATUS (smooth-fronted caiman): DIET AND MOVEMENT. The majority of crocodylian species are opportunistic predators. The smooth-fronted caiman *Paleosuchus trigonatus* is known to prey mainly on terrestrial invertebrates (mainly insects) and small vertebrates (Magnusson et al., 1987).

The National Forest of Saracá-Taquera in the north of Pará state, northern Brazil (FLONA), is a protected area that has a rich array of drains and small to large rivers with elevated plateaus (up to 180 metres). Its unique hydric resources include temporary ponds formed during the wet season. On the plateaus, juvenile specimens of the two known species of *Paleosuchus* (*P. trigonatus* and *P. palpebrosus*) exist. On May 19 2010 during a survey of the crocodylians of the area, one female specimen of *P. trigonatus* (64.5 cm TL, 960 g) was captured in a temporary pond in an elevated area named Bacaba plateau. The individual was found at 80 m elevation and 800 m from the nearest river, indicating that it moved through forest to reach the upper plateau. The stomach contents of the individual were obtained by flushing (see Taylor et al., 1978) and revealed gastrolites and remains of two specimens of *Brotheas paraensis* (Arachnidea, Scorpionia, Chactidae) (Fig. 1). To the best of our knowledge this is the first record of consumption of this scorpion species by a caiman. Scorpions of the genus *Brotheas* are terrestrial (Höfer et al., 1996) and *B. paraensis* is usually found among leaf-litter in dense forests in the area (S.A.A. Morato, pers. obs.). A single record of predation of a scorpion is known for the smooth-fronted caiman. *Brotheas* has been recorded in its diet but this species of scorpion is mainly found nearby water. What is interesting is that the record of two individuals of *B. paraensis* as a dietary item may suggest that smooth-fronted caiman prey terrestrially in forest leaf-litter, not solely in riparian areas (cf. Magnusson et al., 1987). Movement across land to preferred feeding resources has also been recorded for *Caiman crocodylus*, previously considered a riparian specialist (Grant et al., 2008).

Smooth-fronted caiman juveniles are found during the wet season on the upper portions of the plateaus and this may suggest that they move larger distances in their territories when younger.

Only individuals of 50-70 cm (N = 5) were found in these upper areas. According to Magnusson & Lima (1991), adult females of *P. trigonatus* were not strongly territorial when concentrated in small streams with overlapping territories. Juveniles of *P. trigonatus* were also found 100 m from the nearest creek and at a nest 2 km from the Tiputini river, Ecuador Amazon Basin (Rivas et al., 2001). Such movements suggest that smooth-fronted caiman have large territories that encompass terrestrial and riparian habitats although further work on their abundance and distribution is needed to confirm this.



Figure 1. Remains of two specimens (evident from two telsons) of *Brotheas paraensis* (Scorpionida, Chactidae) found in the stomach contents of *Paleosuchus trigonatus* from FLONA de Saracá-Taquera, Pará State, Brazil. Photograph by Sérgio A.A. Morato.

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ENYALIUS BIBRONII (NCN): ECTOPARASITISM. Leiosaurid lizards of the genus *Enyalius* comprise nine recognised species (Bérnils, 2009), restricted to forested areas in Atlantic rainforest remnants of eastern Brazil (Jackson, 1978; Ávila-Pires, 1995), patches of savanna, and gallery forests of the Cerrado in central Brazil, and in scattered patches of the semiarid Caatingas (Rodrigues et al., 2006; Freire et al., 2009). *Enyalius* sp. is mostly diurnal and insectivorous. They use tree trunks, shrubs, fallen logs or leaves as perches, but are also commonly found on the ground or leaf litter (Jackson, 1978; Sazima & Haddad, 1992; Vitt et al., 1996;

Zamprogno et al., 2001; Teixeira et al., 2005). *Enyalius bibronii* Boulenger, 1885 (Figure 1A) is typical of relictual forests of the arid interior of northeastern Brazil (Jackson, 1978) where, according to Rodrigues (2003), after their original habitat deteriorates, this species remains in a few areas that are compatible with their ecological and physiological habits. In this short note we report *E. bibronii* as an unusual egg-laying substrate for a lepidopteran.

During a study of the structure of lizard assemblages, sixteen *E. bibronii* were collected by pitfall traps in a forest enclave (06°10'80"S, 36°43'38"W, 751 m ASL) inside the Caatinga biome, in the municipality of Tenente Laurentino Cruz, State of Rio Grande do Norte, Brazil. The local climate is classified as semi-arid, hot and dry, with rainfall of 705 mm/year, mean temperature of 26.6°C and relative humidity of 65% (Beltrão et al., 2005). On 19 November 2009 at ca. 09:00, during a herpetological survey, MG and LBR collected an adult female *E. bibronii* (97.7 mm SVL) presenting a group of four lepidopteran eggs (~ 1.2 mm in diameter) adhered to its dorsum (Figure 1. B-C). Although the caterpillars had already hatched, the oviposition was identified as of a moth belonging to the family Noctuidae. The eggs were of a sub-spherical shape, slightly flattened and flat based. The corium (outermost extraembryonic membrane, that serves to protect inner layers) was translucent and of a friable texture without pubescence.

The majority of noctuid moths are nocturnal, but there are also crepuscular species (Gallo et al., 1988). In this instance we suggest that the *E. bibronii* was perched on shrubs, vines, tree trunks and branches (Ribeiro pers. obs., Figure 1A) and was possibly mistakenly selected as an oviposition substrate by a female noctuid. The cryptic colour pattern of *E. bibronii* that makes it inconspicuous in its environment may also have confused the moth in its site selection to lay eggs. The selection of an oviposition site is particularly crucial in Lepidoptera as the fitness of the progeny depends mainly on that instinct (Renwick & Chew, 1994). The choosing of an unusual host like *E. bibronii* by the noctuid is unusual and risky because *Enyalius* lizards are known to feed on lepidopteran larvae

(Zamprogno et al., 2001; Sousa & Cruz, 2008). The voucher specimen of *E. bibronii* (CHBEZ 3209) was deposited in the herpetological collection of the Universidade Federal do Rio Grande do Norte, Natal, Brazil.

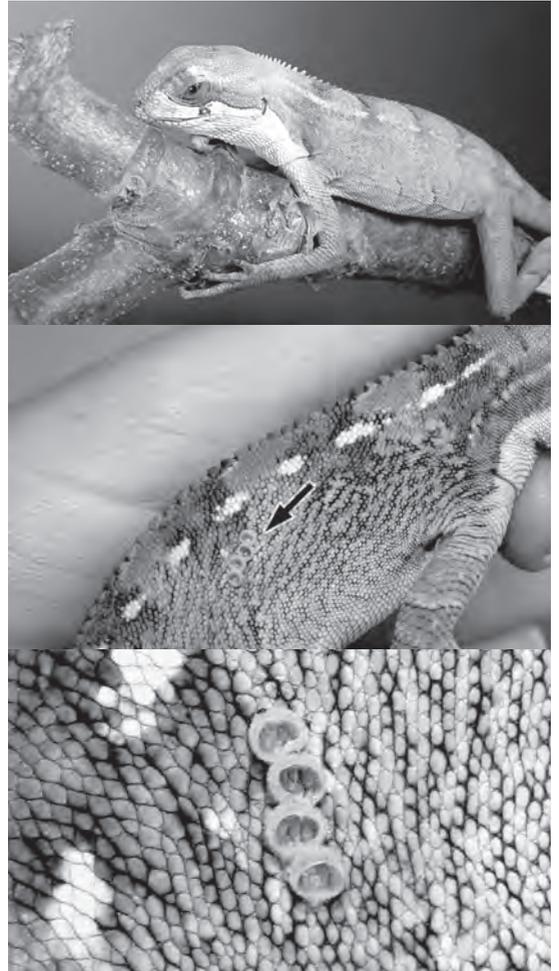


Figure 1. *Enyalius bibronii* as a host of lepidopteran eggs: (A) Specimen resting, at night, on a branch (Top); (B) Group of four eggs on the lizard's dorsum (arrow) (Middle); (C) Detail of the top of the eggs eaten by the caterpillars when they began to emerge (Bottom).

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