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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 20–25g) (Table 1). By 4 July all of the hatchlings had shed their skin and fed voluntarily on young mice (4g).




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.

Number of Individual	Sex	SVL (mm)	Body Mass (g)
1	M	320	25
2	M	330	20
3	M	330	20
4	M	330	25
5	H	330	25
6	H	340	20
Mean and SD		330.0 ± 5.34 mm	22.5 ± 2.31 g

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.).



Fig. 2. A pair of *Loxocemus bicolor* engaged in reproductive activity on 15 October 2010, at Bolsón de Santa Cruz, Provincia de Guanacaste, Costa Rica.  © Alexander Hernández Mora

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).



Fig. 3. A pair of *Loxocemus bicolor* from Honduras copulating in captivity.

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Fig. 4. A captive born and raised *Loxocemus bicolor* ovipositing in captivity.

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Based on these observations and others accumulated by SG, individuals of *L. 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.

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