

## Clutch size and hatchling morphology of Parrot snake *Leptophis liocercus* in the north-east Atlantic Forest of Brazil

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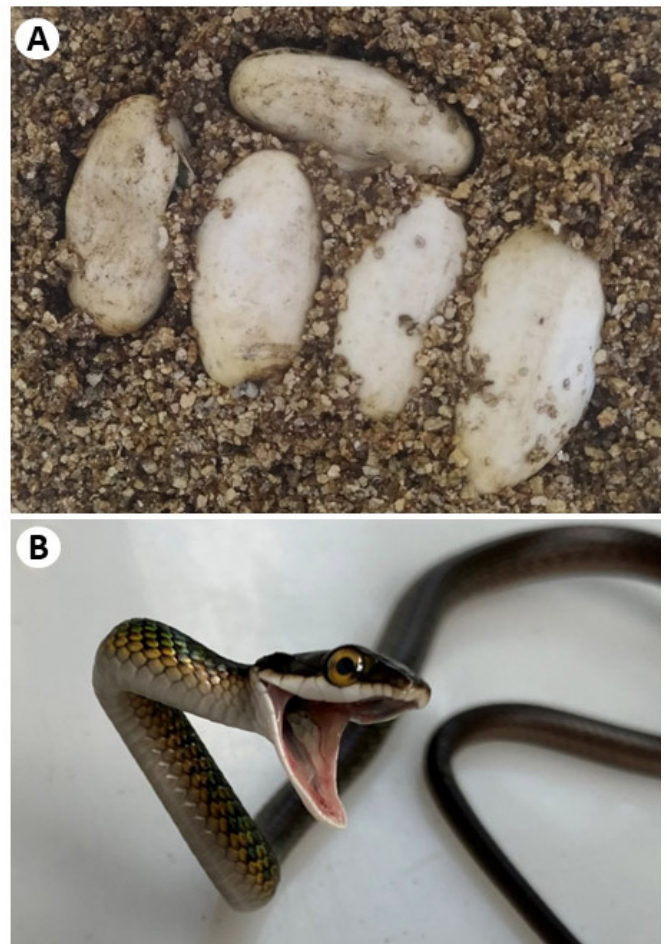
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Parrot snakes (*Leptophis* spp) have been reported in both primary forests and disturbed environments in Brazil (Mattos et al., 2017). These arboreal colubrid snakes are active during the daylight and primarily feed on frogs, although some species may also consume lizards and small rodents (Albuquerque et al., 2007). The genus comprises 19 species distributed in Central and South America, including five species that occur in Brazil. *Leptophis liocercus* (Wied, 1824) was previously known as a subspecies of *Leptophis ahaetulla* but is now recognised as a distinct species (Albuquerque & Fernandes, 2022). It can be distinguished from its congeners by a series of characters, such as the head scales slightly edged with black and without black spots, and an unstriped dorsum, with dorsal colouration changing gradually from dark bluish green to light or dark brown, with scales narrowly edged with black (Albuquerque & Fernandes, 2022). When threatened *L. liocercus* is known to show aggressive behaviours such as biting, flattening their bodies and opening their mouths wide (Pontes & Rocha, 2008). Although some information on the reproductive biology is available for *L. ahaetulla*, *L. depressirostris* and *L. marginatus* (Rand, 1969; Dundee & Liner, 1974; Lewis, 2004; Cruz-Lizano et al., 2013; Linardi, 2016), nothing is known for *L. liocercus*. Herein, for *L. liocercus* we report the dimensions of a clutch of eggs and the emergent neonates found in an area of Atlantic Forest in north-east Brazil.

On 29 September 2022, six eggs of *L. liocercus* were found in a rural area of the Mamanguape municipality, Paraíba state, north-east Brazil (6° 39.31' S, 35° 07'47' W; WGS 84; 44 m a.s.l.), about one kilometre from the Guaribas Biological Reserve. All eggs were found adhering to each other lodged inside a hollow brick, which was in a pile of bricks on a sandy floor outdoors. The eggs were collected and taken to the animal ecology laboratory of the Federal University (UFPB) under license SISBIO 74327-1. The eggs were incubated at a temperature of 20–22 °C, with approximately 60 % relative humidity, half-buried in vermiculite (Fig. 1A). Each egg was measured at the longest



**Figure 1.** Eggs and hatchling of *Leptophis liocercus* – **A.** Five eggs, **B.** Hatchling exhibiting aggressive behaviour

and widest point using a caliper (precision = 0.1 mm). Also, all hatchlings were measured using a digital caliper (precision = 0.01 mm), weighed using a spring scale (0.1 g) and sexed immediately after birth using a probe (Table 1S,

see Supplementary Material). One individual was preserved in formalin 10% and housed in the Herpetological Collection of the Universidade Federal da Paraíba. All other hatchlings were released in the Guaribas Biological Reserve.

The mean ( $\pm$  sd) dimensions of the eggs were  $33.4 \pm 1.8$  mm long and  $13.9 \pm 0.9$  mm wide. One egg was not fertilised and was found to be dehydrated after 16 days of incubation. On 1 December 2022 at 06:55 h, after 63 days (about 2 months) of incubation, two neonates started to hatch and had totally emerged after 5 hours and 20 minutes and 21 hours and 15 minutes respectively. On the same day, at 13:38 h and at 22:30 h other neonates started hatching, and the processes lasted for 4 hours and 40 minutes and 10 hours and 55 minutes, respectively. After a further 24 h the last snake had not started to cut through its egg shell, so we made a small incision in the egg with a scalpel. After 7 hours the snake had emerged completely. The mean ( $\pm$  sd) dimensions of the hatchlings were - total length  $328.0 \pm 18.5$  mm and weight  $3.8 \pm 0.4$  g. A summary of other body dimension can be seen in Table 1S. Of the five snakes, two were males and three females, the sexes were the same colour and appeared not to differ from the adult colouration, and on emergence all presented aggressive behaviour (Fig. 1B).

The clutch size of *L. liocercus* is similar to other *Leptophis* species: *L. ahaetulla* had one to eight eggs per clutch (Martins & Oliveira, 1999), *L. dibernardoi*, three to 12 eggs (Mesquita et al., 2013), *L. mexicanus*, two to six eggs (Censky & McCoy, 1988), *L. depressirostris*, five eggs (Lewis, 2004). Linardi (2016) reported a communal nest for *L. marginatus* with as many as 49 eggs, including at least 12 eggs that must have come from a single female since they were adhering to each other and in the same stage of development. Similar to our observation, these eggs were also inside a hollow cement brick 60 cm above the ground. Our observations on the mean length of the *L. liocercus* neonates, at 328 mm, were very similar to *L. marginatus* in south-east Brazil (318 mm - Linardi, 2016) but somewhat larger than *L. ahaetulla* in Panama (241 mm - Rand, 1969), and *L. depressirostris* in Costa Rica (278 mm - Lewis, 2004). Although clutch size, incubation period and hatchling dimensions appear to be similar among *Leptophis* species, the time of year when hatching occurs varied among species, which should reflect differences in the prevailing environmental conditions.

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