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## A remarkably large gravid Common Lancehead, *Bothrops atrox* (Linnaeus, 1758), and its litter in French Guiana

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The Common Lancehead, *Bothrops atrox*, is a common snake in most countries of South America. Despite a high degree of polymorphism in morphology, molecular analysis has shown that only little genetic variations exists across the species' range, which does not support the hypothesis of local speciation events (Wüster et al., 1996, 1999; Salomão et al., 1999). Most human envenomations by snake bites in South America are caused by this species (Monteiro et al., 2020), and this is also the case in French Guiana (Véronique Lambert, Centre Hospitalier de l'Ouest Guyanais, pers. comm.). Despite its wide distribution and frequent occurrence, data on the biology of *B. atrox* generally remain scarce, and we lack information regarding local variation in habitat, diet, and reproduction (Campbell and Lamar, 1989; Campbell et al., 2004). We here describe a large gravid female killed after a human interaction in French Guiana. The circumstances of the unexpected acquisition of this specimen (no freezer space, no preservation liquid, rudimentary weighing scales, no fine-resolution camera) meant that standard scientific procedures for the collection of basic data could not be fully upheld. However, serendipitous records like this are important to gain a better understanding of natural history data when it is otherwise scarce.

On 17 November 2021 at 09:20 h, in a residential area near Mana, western French Guiana (5.6118°N, 53.7064°W, elevation 15 m), a Common Lancehead resting in the shade at the edge of the forest was disturbed by a dog. The snake first threatened the dog

and subsequently struck at it. The dog survived the envenomation after treatment with anti-inflammatories and antibiotics, and we note that complications and deaths of dogs after envenomation by this snake are very rare in French Guiana (Dr. Attalah, veterinarian, pers. comm.). The snake was killed by the dog owner just after the bite and frozen for later identification by the first author. The snake was not preserved after acquisition because it was too large to accommodate, no museum was located near the observation area to provide alcohol or formalin, and no professional herpetologist was available at the time of the incident. Identification and measurements were made by FS, after the snake had been thawed.

This female specimen is remarkable for its large size and also for the number of embryos present in its reproductive tract. It measured 1570 mm in total length (TL) and 1360 mm in snout–vent length (SVL; Fig. 1A). The distal part of the head was partially damaged when the snake was killed, so that the intact specimen would have been slightly longer. After thawing, it weighed 1400 g with all embryos.

The largest reported sizes for Common Lancehead females come from Brazilian Amazonia: 1230 mm SVL (Tavares-Pinheiro et al., 2020), 1415 mm TL (1265 mm SVL; Bisneto and Kaefer, 2019), 1460 mm TL (Cunha and Nascimento, 1978), and 1532 mm TL (Martins and Oliveira, 1998). An individual of 1718 mm TL (1525 mm SVL) was encountered in Colombia (Quiñones-Betancourt et al., 2018). A total length of 2000 mm is assumed to be the maximum length for the species (Campbell and Lamar, 1989). In French Guiana, the largest female previously reported measured 1220 mm TL (Gasc and Rodrigues, 1980), making our observation (1570 mm TL) a size-record for this French department and one of the largest known for the species. Note that the size usually encountered in this species in French Guiana is 700–850 mm TL, about half of the size reported here.

Upon dissection, we counted 42 developed embryos and four undeveloped eggs in the snake's reproductive tract. One of the 42 embryos was malformed, presenting with a bent spine. All embryos were fully developed and close

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to delivery, as shown by their almost completely resorbed yolk sacs. The number of embryos that we observed ( $42 + 4$  undeveloped eggs) is one of the largest recorded for the species. Rojas-Morales et al. (2021) mentioned 14 oviducal eggs in the Colombian Andes, while Tavares-Pinheiro et al. (2020) recorded 21 neonates from a female in the Brazilian Amazonia. Silva et al. (2019) reported litter sizes averaging  $11 \pm 8$  neonates (range 3–32;  $n = 19$ ), which were positively correlated with female SVL. A litter size of 43 was cited by Martins and Oliveira (1998) in Brazil in a disturbed area in the region of Manaus, and litter numbers varying between 8–43 were reported by Quiñones-Betancourt et al. (2018).

Our measurements of ten almost fully developed embryos taken randomly among the brood indicate an average TL of 251 mm (range 244–265 mm). Mean neonate SVL size was  $239 \pm 4.4$  mm (range 236–242 mm;  $n = 21$ ) in Brazilian Amazonia (Tavares-Pinheiro et al., 2020), while Silva et al. (2019) reported an average offspring SVL of  $228 \pm 23$  mm (range 156–254 mm;  $n = 49$ ), with offspring tail length averaging  $40 \pm 5$  mm (range: 27–50 mm,  $n = 49$ ).

The total weight of the 42 embryos and the four undeveloped eggs was 340 grams, just over 24% of the female's total weight. Average weight, taken by weighing together those same ten randomly taken embryos and dividing the total weight by ten (due to the fact that the weighing scale was not sufficiently accurate to measure each specimen individually) was approximately 6 g per embryo. The reproductive investment that we observe

in our female from French Guiana (24%) is comparable to the percentage of maternal investment of 20.1% calculated by Vespasiano (2022), who considered the prepartum and postpartum mass of females.

The fact that the killed female from French Guiana was in the last stage of gestation is consistent with observations from other regions, which indicate that births in this species generally peak at the start of the rainy season (November–December; Cunha and Nascimento, 1978; Gasc and Rodrigues, 1980; Chippaux, 1987; Martins and Oliveira, 1998; Campbell et al., 2004; Starace, 2013; Silva et al., 2019). Usually, pregnant snakes stop feeding during gestation (Grego et al., 2021). The female in our study seemed to be in perfect health and its fat reserves were still obvious (Fig. 1B). This suggests that it was living in a favourable environment in terms of prey availability, and that it fed well before gestation.

*Bothrops atrox* is a ubiquitous crotaline in French Guiana, as well as elsewhere in its range (Fraga et al., 2013). The choice of habitat might also be correlated with variation in venom composition, as related to the local availability of different prey species (Bisneto and Kaefer, 2019; Sousa et al., 2021). Its highly variable diet includes arthropods, amphibians, lizards, snakes, birds, and small mammals (Cunha and Nascimento, 1978; Chippaux, 1987; Martins and Oliveira, 1998; Starace, 2013; Ineich and Starace, 2015; Starace et al., 2021). This diversity of species it can feed upon might explain the high densities in some *B. atrox* populations (Fraga et al., 2013).



**Figure 1.** An unusually large, gravid female *Bothrops atrox* from French Guiana. (A) General dorsal view. (B) Ventral view showing embryos and fat reserves in the body cavity. Photos by Fausto Starace.

Our observation made in a peri-urban habitat does not imply that the snake benefits from these highly human-modified environments, where some commensal prey species are more abundant. However, snakes can theoretically find abundant food there and can then reach record sizes and produce high numbers of offspring per brood, but this has yet to be demonstrated.

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