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First record of twin hatchlings in *Caiman latirostris* (Daudin, 1802) in the Atlantic Forest, Brazil

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ABSTRACT

Embryo twinning is quite common in reptiles, possibly due to atypical incubation conditions, although few specimens hatch and reach adulthood, especially in the wild. In crocodilians, eggs with double yolk or monozygotic twins are usually produced by young females and laid at the beginning or end of oviposition. This scientific note aimed to report the first record of twinning caimans in the Brazilian Atlantic rainforest from a *Caiman latirostris* clutch, found during the 2021 nesting season in Tapacurá Ecological Station. Both twins were healthy and without deformities, just slightly lighter and smaller than the average of the nest. However, this may compromise their survival until sexual maturity, as larger hatchlings tend to have a higher survival rate than smaller ones. This is despite nesting females reacting more to the vocalization of smaller specimens, which promotes more maternal care. This study advances the understanding of crocodilian reproductive biology by documenting the first record of wild *Caiman latirostris* twins, highlighting the crucial role of field research in uncovering ecological, genetic, physiological, and evolutionary insights.

Keywords: Broad-snouted caiman, nest, crocodilians.

Introduction

Embryo twinning is quite common in reptiles, such as turtles (Eckert, 1990), lizards (Van Schingen & Ziegler, 1997), snakes (Marion, 1980), and crocodilians (Piña, Larriera & Cabrera, 2003; Hinlo & Penetrante, 2010; Velasco, 2010). However, few specimens hatch and reach adulthood due to body deformation, mainly in the wild.

The origin of these embryonic processes may be related to atypical incubation conditions, such as extreme levels of humidity gradient, anoxia, and chemical teratogens, or female genetic and morphological conditions (Eckert, 1990; Platt et al., 2012).

In crocodilians, eggs with double yolks or monozygotic twins are usually produced by young females, laid at the beginning or end of oviposition, but uncommonly hatch at the end of the incubation period (Platt et al., 2012).

This study aims to document twin hatchlings of broad-snouted caimans (*Caiman latirostris*) in Brazil´s Atlantic rainforest.

Material and Methods

Field surveys were conducted from February to May 2021, following the procedures described in Barboza et al. (2024) during the broad-snouted caiman (*Caiman latirostris* (Daudin, 1802) nesting season in Tapacurá Ecological Station; an Atlantic rainforest fragment located in Pernambuco, north-east Brazil (8.059ºS, 35.1725ºW). The region features semi-deciduous forests in a tropical climate, with an average annual rainfall of 1,300 mm (Moura, Azevedo Junior & El-Deir, 2012). The area comprises private lands dedicated to agriculture, fishing, and extensive cattle and goat farming, alongside remnants of Atlantic Forest fragments within protected zones of varying conservation statuses, covering a total of 590 hectares.

Results and Discussion

On February 24th, a nest with 32 eggs was found occasionally at the edge of the forest. The average length of the eggs was 65 mm, 40 mm in width, and 61.5g in weight, and the average temperature of incubation was 30.46°C (ranging from 23.48ºC to 37.38ºC).

The clutch hatched on May 6th, and one of the eggs hatched with twin' individuals (Figure 1). The twins hatched with 18.8 and 16.5 cm of total length (TL), 8.4 and 7.8 cm of snout-vent length (SVL), and 26 and 18 g of weight. Both twins were healthy and without deformities, though slightly lighter and smaller than the nest average (22.6 ± 1.34 cm TL, 10.57 ± 0.67 cm SVL, and 32.66 ± 8.26 g) (Figure 2). This size difference is likely due to space constraints during embryonic development (Larriera & Imhof, 2004).

Figure 1. *Caiman latirostris* twins in Tapacurá Ecological Station in 2021, Brazil (A and B); Comparison between twins (left hand) and other hatchlings (right hand) from the clutch (C). Font: Barboza et al. (2021).

Even with the healthy appearance of hatchlings, size can influence them in different ways. The length of twins that hatch is generally smaller than the average of the clutch and shows a slow growth pattern during their life, which may compromise their survival until sexual maturity (Webb et al., 1983a; Larriera & Imhof, 1994; Platt et al., 2012).

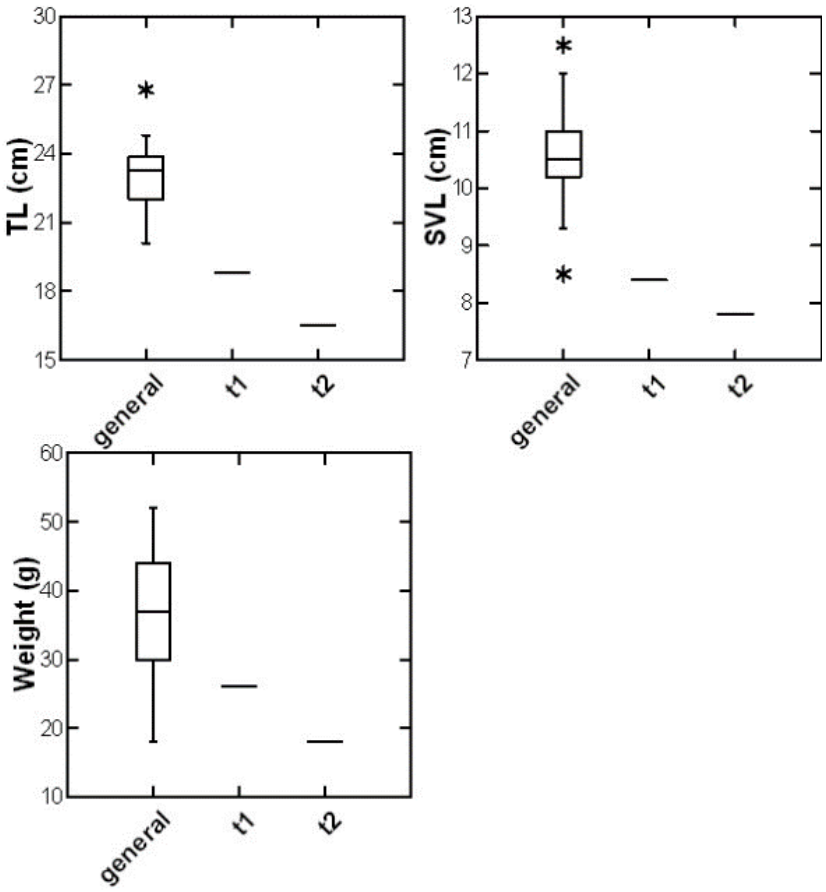

Figure 2. Morphometric and weight comparison between twins (t1 and t2) and all hatchlings measured (general; N=136). TL = Total length; SVL = Snout-vent length. Font: Barboza et al. (2021).

While nesting females react more to the vocalization of smaller specimens (Chabert et al., 2015), bigger hatchlings tend to have a higher survival rate than smaller ones, even with reduced parental care (Deitz & Hines, 1980). Diminutive hatchlings experience heightened predation vulnerability across a broader predator spectrum, with this susceptibility decreasing as they grow beyond gape-limited predators.

The records of twins in crocodilians have been reported in the Crocodylidae and Alligatoridae families, including cases of double yolk and siamese twins (Table 1).

Table 1. Twinning occurrence registered in Crocodylia, divided by type of twinning and crocodilian species. Font: Adapted from Ferguson (1981).

Type of twinning	Species	Area	Reference
Double yolk	*Alligator mississippiensis*	United States of America	Ferguson & Joanen (1983)
	Crocodylus acutus	Not informed	Neill (1971)
	C. niloticus	Not informed	Blomberg (1979)
	C. porosus	Australia	Webb et al. (1983b)
Twins	*A. mississippiensis*	Not informed	Reese (1906); Ferguson (1981)
	C. johnstoni	Not informed	Ferguson (1981)
	Caiman latirostris	Argentina, Brazil	Piña, Larriera & Cabrera (2003)
	C. mindorensis	Philipines	Hinlo & Penetrante (2010)
	C. niloticus	Not informed	Ferguson (1981)
	C. porosus	Australia	Williamson et al. (2017); Ferguson (1981)
	C. siamensis	Cambodia (captive)	Platt et al. (2012)

	Osteolaemus tetraspis	Not informed	Tryon (1980)
Axial bifurcation and partial twinning (Siamese's / omphalopagus)	*A. mississippiensis*	United States of America	Ferguson (1981)
	Caiman latirostris	Argentina	Larriera & Imhof (1994)
	C. niloticus	Not informed	Ferguson (1981)

Previous records of twinning in broad-snouted caiman have been registered in captivity (Piña, Larriera & Cabrera, 2003), and this study represents the first-ever twinning event for wild broad-snouted caimans. This may explain their post-hatching survival success.

Conclusion

The study further contributes to the understanding of crocodilian reproductive biology in their natural environment by documenting the first record of twins of *in situ Caiman latirostris.* The recording of such a rare event underscores the continued importance of field research in natural environments to broaden the comprehension, most importantly, of ecological, genetic, and evolutionary knowledge of crocodilians.

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