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Parental care in the dwarf caiman, *Paleosuchus palpebrosus* Cuvier, 1807 (Reptilia: Crocodylia: Alligatoridae)

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Post-hatching parental care is common in crocodylians, but the little information available for Cuvier's dwarf caiman (*Paleosuchus palpebrosus*) indicates that they show little post-hatching parental care. During surveys undertaken between 2005 and 2011, we counted and captured groups of hatchlings and observed the presence or absence of attending adults in streams around the Pantanal, along the Guaporé-Madeira River and flooded forest in central Amazonia, Brazil. We found 37 groups of hatchlings, of which 29 were accompanied by adults. We captured 13 of these adults and all were females. The groups of hatchlings remained with adults for up to 21 months. We monitored females and hatchlings in streams around the Pantanal using captures and with radiotelemetry and showed that females and hatchlings frequently remained together in burrows, especially during the dry season.

Keywords: dwarf caiman; maternal care; radiotelemetry

Introduction

Parental care of eggs and young is common in crocodylians, and many species care for young for weeks, e.g. *Caiman crocodilus* (Staton and Dixon 1977), to more than a year after hatching, e.g. *Alligator mississippiensis* (Chabreck 1965; Lang 1987). Parental care varies among the small species of crocodylians. Adult *Osteolaemus tetraspis* accompany juveniles for many months after hatching (Tryon 1980), but juvenile *Paleosuchus trigonatus* disperse within a few weeks after hatching and are not accompanied by an adult (Magnusson and Lima 1991). Medem (1981) reported that juvenile *Paleosuchus palpebrosus* were generally encountered singly or in pairs and were not accompanied by adults. However, he noted that there was little information on which to make conclusions about the behaviour of the species.

Even basic information, such as the mean size of individuals of the species, is often unreliable for *P. palpebrosus*. Recent studies have shown that the average size of *P. palpebrosus* is much larger than previously thought throughout its range (Campos et al. 2010). In this study, we describe hatchling groups of *P. palpebrosus* in Amazonia and in streams around the Pantanal, and estimate the time for which adult females accompany these groups.

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Material and methods

Nocturnal surveys for hatchling groups were carried out with boat, canoe and on foot between 2005 and 2011 in flooded forest (igapó) in central Amazonia (08°78' S, 63°94' W), along the Guaporé-Madeira River (between 08°78' S, 63°94' W and 15°02' S, 59°58' W) in southwestern Amazonia, and streams and rivers around the Brazilian Pantanal (between 15°37' S, 57°12' W and 18°05' S, 57°51' W, Figure 1). Caimans were located by their eye shine when illuminated by a head light or a sealed-beam spotlight. The number of hatchlings in the group and the presence or absence of an adult were noted. When possible, hatchlings and any accompanying adult were captured with a lasso attached to a pole and by hand.

Snout-vent length (SVL; in cm) of all animals captured was measured and animals were weighed with a spring balance accurate to 1 g for animals up to 600 g, and accurate to 0.5 kg for larger animals. Age of hatchlings was estimated from the time



Figure 1. Locations of survey in three sites, around the Pantanal (1), in the Guaporé-Madeira (2) and Amazon Rivers (3), Brazil.

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between detection and the modal month of eclosion from eggs in that area (April in the streams around the Pantanal, December in the Guaporé-Madeira, and January in central Amazonia; Zilca Campos unpublished data, 2011).

Two females and a hatchling were radio tracked in streams around the Pantanal (19°08' S, 57°4' W) in 2008 and 2011. A radio (Sirtrack™ model ZV1/116; Sirtrack, Havelock North, New Zealand) was implanted in the abdominal cavity of a female with SVL = 65.0 cm on 6 November 2008 using the methods described in Campos et al. (2006) for *C. crocodilus*. Radios (Sirtrack™ model ZV1/116 and ZV1/110) were attached to the tail scutes of an adult female (SVL = 79.5 cm) and a hatchling (SVL = 20.0 cm) on 28 April 2011, following the method described by Munoz and Thorbjarnarson (2000). Two other hatchlings were caught with this animal but did not receive radios. Radios (Sirtrack™ model ZV1/110) were attached to the tails of two hatchlings (SVL = 14.3 and SVL = 14.2 cm) on 18 June 2012. These were found together in the same burrow with two other hatchlings and an adult that were not captured. Animals were tracked with a TR4 receiver (Telonics™; Telonics Inc., Mesa, AZ, USA) on foot all day.

Results

A total of 37 hatchling groups were found, of which 29 (78.9%) were seen to be accompanied by an adult: nine in central Amazonia, 10 in the Guaporé-Madeira and 10 in the streams around the Pantanal. The mean number of hatchlings per group (6 ± 3.2 , range 1–14) was similar among the three sites (Figure 2). However, the number of

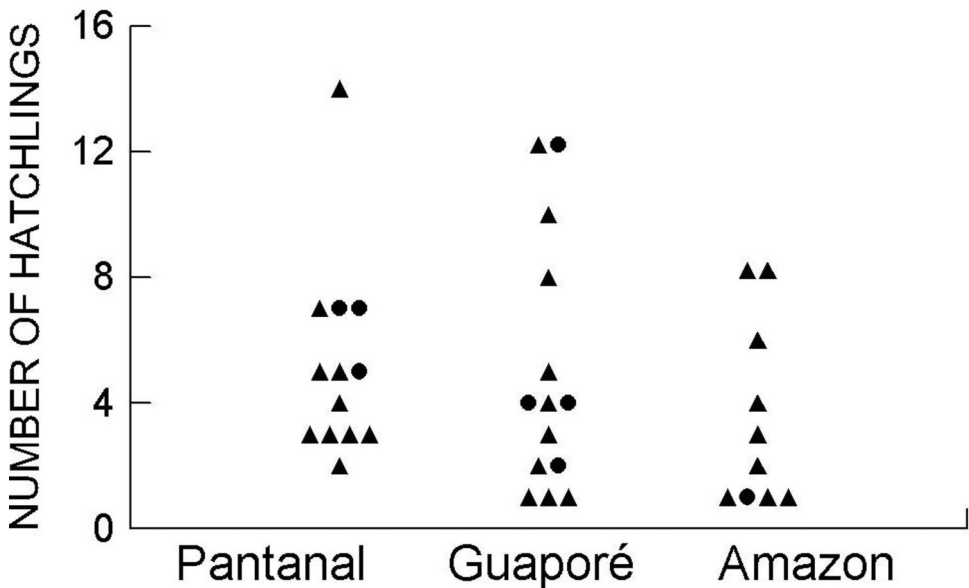


Figure 2. Number of hatchlings of *Paleosuchus palpebrosus* counted in sites around the Pantanal, in the Guaporé-Madeira and Amazon Rivers between 2005 and 2011. Groups accompanied by an adult are indicated by triangles, and those for which an accompanying adult was not detected are shown by circular symbols.

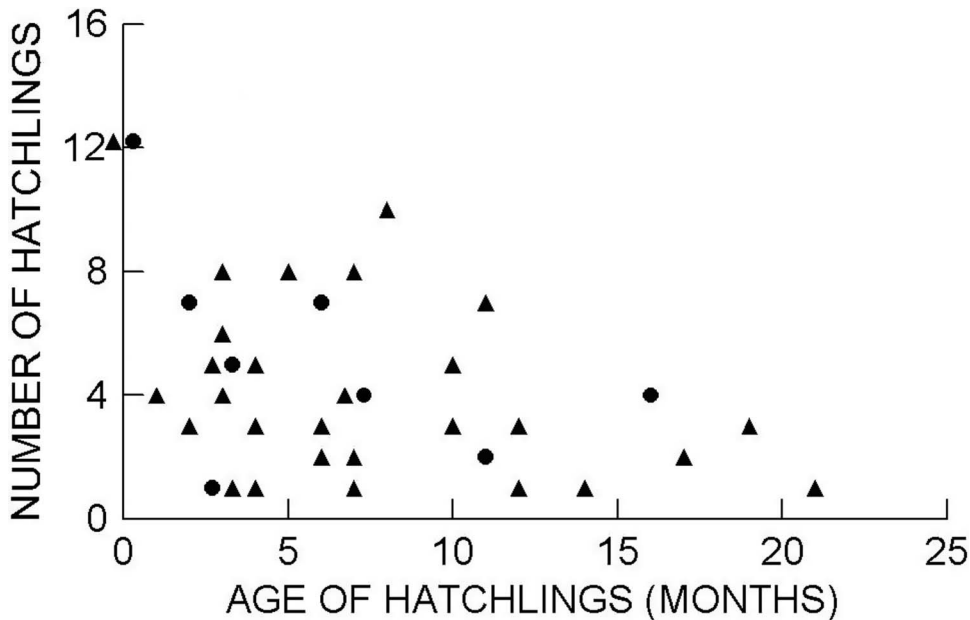


Figure 3. Number of hatchlings of *Paleosuchus palpebrosus* of different estimated ages with (▲) and without (●) an accompanying adult.

individuals in a group or accompanied by an adult (n) decreased with the estimated age (A in months) of the individuals ($n = 9.988 - 0.571A$, $n = 37$, $r^2 = 0.12$, $p = 0.04$), and few groups or individuals accompanied by an adult had estimated ages greater than 12 months (Figure 3).

Thirteen adults accompanying groups were captured (six in central Amazonia, four in the Guaporé-Madeira and three in the Pantanal) and all were females. Their SVLs varied from 60 to 79.5 cm (mean = 69.6, SD = 5.3) and mass varied from 5 to 12 kg (mean = 8.3, SD = 1.9). Mean SVL of hatchlings and juveniles in groups varied from 11.0 to 32.0 cm. The largest mean SVL of a group accompanied by a female was 32.0 cm, but few hatchlings with SVL > 22 cm (estimated age of 12 months) were encountered in groups or accompanied by an adult.

Two groups had hatchlings with disparate sizes, indicating that hatchlings from the previous nesting season may remain with hatchlings from the current season. The maximum estimated age of a hatchling accompanied by an adult was 21 months.

The female monitored by radio telemetry in November and December 2008 remained in a burrow together with three hatchlings until they had estimated ages of 21 months. The female tracked between April and August 2011 remained with three hatchlings estimated to be between 12 and 16 months old during the period. The female was located on 150 days in this period and at no time was she recorded more than 50 m from the group of juveniles. After this period, the radio ceased to function and the female was not found near the hatchlings. The hatchling with the radio was monitored for another month (180 days) before its radio also ceased to function. Two hatchlings from another group were only monitored for 1 month, but at that time they were still accompanied by two other hatchlings and an adult in a burrow.

Discussion

Paleosuchus palpebrosus shows parental care for as long as any other crocodylian that has been studied intensively. The period of parental care and size of hatchling groups were similar in the three study areas, which have very different environmental conditions. Therefore, the lack of parental care reported by Medem (1981) was probably a result of the lack of data available at that time, and the short period of post-hatching parental care reported for *P. trigonatus* in central Amazonia (Magnusson and Lima 1991) is not characteristic of the genus.

As suggested by Medem (1981), most parental care of *P. palpebrosus* is undertaken by females (presumably the mothers of most individuals in groups). We recorded no instances of males accompanying groups of hatchlings, but we were not able to capture all adults associated with groups.

The mean size of groups was reduced gradually with time since hatching, but we do not know if this is because of mortality or dispersal of hatchlings. Groups monitored for long periods showed the same reduction in number with time. However, the reduction in number was higher in groups that initially had more members. The modal size of groups changed little until 12 months after hatching. Some groups had hatchlings of different sizes, indicating that older juveniles may associate with juveniles from the current nesting season, but no individual estimated at more than 21 months was found associated with an adult. Therefore, the association between juveniles and adults does not extend to the second year after hatching. We do not know if this is induced by juvenile or adult behaviour.

We assume that adult females associated with hatchlings were the mothers of the group. However, genetic studies will be necessary to confirm this hypothesis and evaluate the proportion of hatchlings that are from other nests. *Paleosuchus palpebrosus* is one of the least studied crocodylians, but this and other recent studies (Campos and Sanaiotti 2006; Campos et al. 2010) indicate that much of its natural history is typical of other crocodylians.

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