Schneider's Smooth-fronted Caiman
Paleosuchus trigonatus

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Common Names: Smooth-fronted caiman, Schneider's smooth-fronted caiman, Cachirre, Jacaré-coroa, Jacaré-curuá una

Range: Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname, Venezuela

Figure 1. Distribution of *Paleosuchus trigonatus* (based on Campos *et al*. 2013, 2017).

Conservation Overview

CITES: Appendix II

CSG Action Plan:
- Availability of survey data: Poor
- Need for wild population recovery: Low
- Potential for sustainable management: Low

2018 IUCN Red List: Lower Risk/Least Concern. Widespread and remains locally abundant, although quantitative data are lacking (last assessed in March 2018; Campos *et al*. 2019).

Principal threats: Habitat destruction, local subsistence hunting, pollution, urbanization, dams

Figure 2. *Paleosuchus trigonatus*. Photograph: Zilca Campos.

Ecology and Natural History

Paleosuchus trigonatus has a maximum length of around 2.3 m (Medem 1952, 1981). It is well adapted to a terrestrial mode of life and in swift-running waters (Medem 1958). It has a similar distribution to *P. palpebrosus*, but does not enter the Brazilian shield region or the Paraguay River drainage. In Brazil *P. trigonatus* is found principally in the rivers and streams of heavily-forested habitats (Magnusson 1992; Villamarím *et al*. 2017), in igapó forest in the Central Amazon (Mazurek-Souza 2001), and open water or near waterfalls in the large rivers such as the Mamoré, Madeira, Abunã (Vasconcelos and Campos 2007) and Beni Rivers (Z. Campos, unpublished data). Campos *et al*. (2017a) presented new records of occurrence of the species and extended its geographical distribution. The main threats to the species are habitat loss and loss of connectivity in Amazonian rivers (Campos *et al*. 2013). Road kills occurred in the area near the Madeira River (Campos *et al*. 2012). *Paleosuchus trigonatus* are killed both intentionally and incidentally by human activities at a hydroelectric dam (Campos 2015) and areas in Roraima (Muniz *et al*. 2015). Campos *et al*. (2017b)

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studied the movement of four *P. trigonatus* individuals before and after filling of the Santo Antônio hydroelectric reservoir on the Madeira River in the Brazilian Amazon - home ranges varied between <1 and 5 km^2. In Peru, *P. trigonatus* were captured in an artificial pasture approximately 3 miles southwest of Iberia, Departamento de Madre de Dios (Campell 1973). In Venezuela, *P. trigonatus* is principally restricted to oligotrophic forest streams from 100 to 1200 m asl (Goshalk 1982; Gorzula and Paolillo 1986; Gorzula *et al.* 1988; Seijas 2007), and has been reported at elevations up to 1300 m. The habitat in Bolivia is similar to that reported for *P. palpebrosus* (King and Videz-Roca 1989).

Hrbek *et al.* (2008) investigated the phylogenetic relationships of South American alligatorids and identified signs of strong population genetic structuring in *Paleosuchus* spp. in the upper Madeira River. Microsatellite genetic markers were characterized for the species using the traditional construction of DNA enriched libraries (Vilela 2008). Muniz *et al.* (in prep.) are developing new microsatellites markers using Next Generation Sequencing and evaluating genetic diversity and genetic structure of *P. trigonatus* from the Madeira and Xingu Rivers. Bittencourt (2016) found strong genetic structure between *P. trigonatus* individuals from two areas using total cytochrome b gene. Future studies will target genetic variability using biparental molecular markers, mating systems and morphometry of individuals in the Mamoré-Madeira-Abunã system and other rivers in the Amazon.

Magnusson (1989) summarized much of the published information on this species. Pritchard (1995) reported a specimen emerging from the sea onto a beach in Guyana, although the identification of the specimen may be in question (Ross *et al.* 1995). Ecological studies on this species by Magnusson (1985) and Magnusson *et al.* (1987) revealed that the diet is comprised to a large extent of terrestrial vertebrates. Juveniles and adults consume vertebrates such as small fish, birds, reptiles and mammals (Magnusson *et al.* 1987). A predation event by *P. trigonatus* on *Rhinella marinus* (cane toad) in northern Brazil was described by De Assis and Santos (2007). Two specimens of *Brotheas paraensis* were found in the stomach contents of *P. trigonatus* (Morato and Batista 2011). Sampaio *et al.* (2013) observed a juvenile *P. trigonatus* eating a *Caecilia marcusi* in a small pond. Ortiz *et al.* (2013) witnessed a predation attempt by a 1.5 m long *P. trigonatus* on a porcupine (*Coendou* sp.). Villamarin *et al.* (2017) combined stable isotope and spatial analyses and found evidence of diet differences between the two species of *Paleosuchus* independent of habitat selection. Villamarín *et al.* (2018) used data on diets, growth rates and stable isotopes in *Paleosuchus* species to show that reported ontogenetic changes in trophic position of crocodiles based on δ15N reflect more changes in physiology related to size than changes in diet. Merchant *et al.* (2016) proposed that the enlarged nuchal scutes of *P. trigonatus* could be used to discourage predation.

Estimated minimum ages at reproduction for wild *P. trigonatus* are 11 years for females and 20 years for males (Magnusson and Lima 1991). Egg-laying apparently takes place at the end of the dry season and many mound nests are located adjacent to or on top of termite mounds, thereby maintaining a stable elevated nest temperature (Magnusson *et al.* 1990). The incubation period, in excess of 100 days, appears to be the longest of any crocodilian (Magnusson *et al.* 1985; Yamakoshi *et al.* 1987; Magnusson 1989). Embryonic development of *P. trigonatus* was described by Vasquez (1983). Rivas *et al.* (2001) reported a *P. trigonatus* nest with 16 eggs in the Ecuadorian Amazon Basin, in terra firma habitat, and measured 5 hatchlings. In Venezuela, a nest of was found in May, with 13 eggs, 8 of which were intact - it had been partially predated by tegu lizards *Tupimanbis* sp. (Valeris *et al.* 2014). In Brazil, female *P. trigonatus* attempted to defend their nests from attacks by armadillos (*Priodontes maximum* and *Dasypus novemcintus*), but were not observed to defend nests against coati (*Nasua nasua*), tayra (*Eira barbara*) or *Tupimanbis teguixim* (Campos *et al.* 2016). The nests had between 12 and 19 eggs and were attacked by predators after more than 60 days of incubation (Campos *et al.* 2016).

Ziegler and Olbort (2007) provided photographs of the penis of two males that measured 100 cm and 115 cm SVL length, respectively, and the clitoris of one female adult *P. trigonatus*.

A distinct species of *Oswaldofilaria* was obtained from Colombian *P. trigonatus* (Marinkelle 1981). β-Springene in the paracloacal gland secretions of *P. trigonatus* was described by Avery *et al.* (1993).

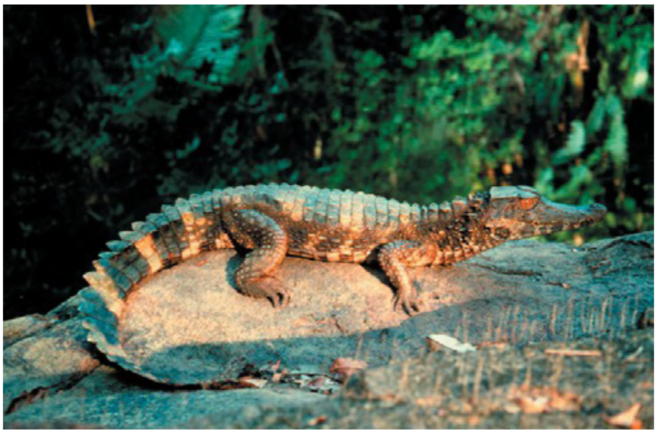

Figure 3. *Paleosuchus trigonatus*. Photograph: Bill Magnusson.

Conservation and Status

Most reports of *P. trigonatus* have originated from surveys conducted for other species of crocodilians. Owing to the limited potential for commercial exploitation, *P. trigonatus* has been hunted mostly on a subsistence basis and populations appear to remain healthy throughout the species' range. Environmental pollution associated with gold mining in Venezuela and Brazil (and increasingly in Bolivia and Peru) appears to be having an increasingly negative impact on riverine ecosystems and is affecting this and other crocodilian species. Conservation of *P. trigonatus* is dependent on maintaining the forest and headwaters of the watersheds within its range.

Due to small body size and extensive ventral ossification, the commercial value of the skin of *P. trigonatus* is very low. The management of *P. trigonatus* is based principally on protection of wild populations. Limited cropping for the pet trade is only allowed in Guyana, under a CITES quota (currently 1000 animals per year).

Figure 3. *Paleosuchus trigonatus*. Photograph: Colin Stevenson.

Priority Projects

High priority

1. **Monitoring abundance and evaluation of habitats**. Because of its extensive distribution, the overall abundance of *P. trigonatus* appears relatively unaffected by habitat destruction, deforestation and dams as well as the pressure of hunting in the Amazon and Mamoré-Madeira-Abunã River systems. Surveys are urgently required in all Range States for *P. trigonatus* in order to quantify the status and assess potential local threats. With this knowledge, appropriate conservation management programs can be developed.

2. **Investigations on ecology and population biology**. Although more is known about the behaviour and ecology of this species than of *P. palpebrosus*, most of the studies have been concentrated in central Amazonia and many aspects of the species' life history remain uninvestigated. One important management-related topic is to determine the effect of gold mining, hydroelectric dams, urbanization and illegal hunting on populations of *Paleosuchus*.

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