

Size of caimans killed by humans at a hydroelectric dam in the Madeira River, Brazilian Amazon

Crocodylians face conflicts with humans where they use aquatic environments to seek food, leisure and housing. The Nile Crocodile, *Crocodylus niloticus* LAURENTI, 1768, and the Saltwater Crocodile, *Crocodylus porosus* SCHNEIDER, 1801, are among the species that most frequently attack humans (BOYLE et al. 2009; WEBB et al. 2010), but also other species are killed by local people, who believe that the crocodylians compete with them for food, principally fish. Killing of crocodylians has intensified with habitat loss caused by fishing, sand mining, hydropower, tourism and housing in areas close to rivers and other aquatic environments (FERGUSON 2010). This has caused an increase in the likelihood of attacks on humans (WALLACE et al. 2012).

Four species of crocodylians occur in the Amazon region, and one, the Black Caiman, *Melanosuchus niger* (SPIX, 1825), can reach 6.0 m in length (MEDEM 1983). There are many reports of attacks on humans during activities, such as fishing, on the shores and rivers (DA SILVEIRA & THORBJARNARSON 2010; HADDAD & FONSECA 2011). Fishing with fixed hooks is not prohibited under Brazilian law and fishermen make use of this practice in many



Fig. 1.: Black Caiman, *Melanosuchus niger* (SPIX, 1825), killed by a gun shot. Reservoir area of the Santo Antônio dam, Madeira River, RO, Brazil.

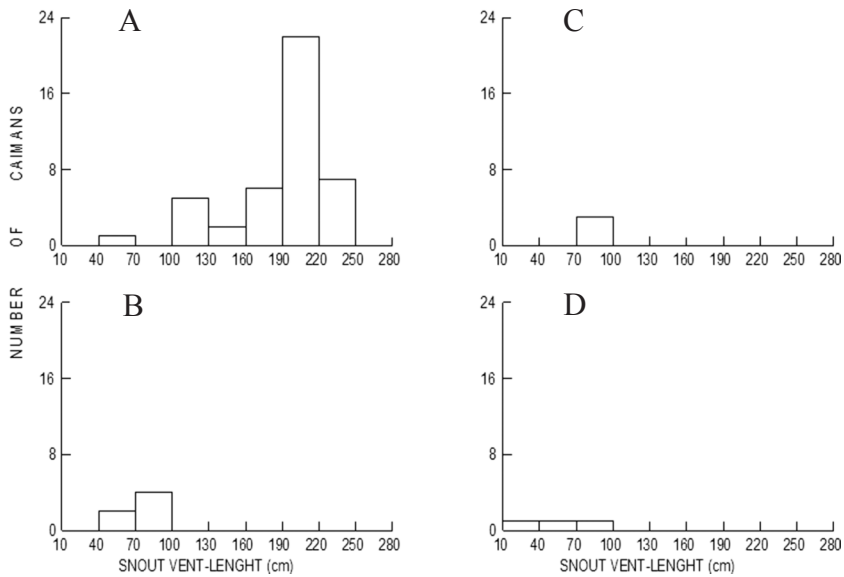


Fig. 2.: Size distribution of the caimans killed by humans in the reservoir area of the Santo Antônio dam, Madeira River, RO, Brazil.

A - *Melanosuchus niger* (SPIX, 1825) (N = 42); B - *Caiman yacare* (DAUDIN, 1802) (N = 6); C - *Paleosuchus trigonatus* (SCHNEIDER, 1801) (N = 3); D - *Paleosuchus palpebrosus* (CUVIER, 1807) (N = 3).

Amazonian Rivers (BARTHEM 1987; BAYLEY et al. 1989). Crocodylians are attracted by fish caught on the lines. Hydroelectric dams change river shorelines and often force caimans into closer contact with people. In this study, the author recorded crocodylians killed by humans in the newly flooded Santo Antônio dam, Madeira River, Amazon Basin.

From September 2010, to May 2013, dead caimans floating near the banks of the Madeira River and its tributaries were recorded (Fig. 1). The reservoir area of the Santo Antônio dam (8°47'S, 63°57'W), Madeira River, was formed in October/November 2011 and extends to 100 km at inundation periods. Each dead caiman was inspected to determine the cause of death based on physical evidence, such as bullet wounds or the presence of a hook. The length of the head (tip of snout to posterior end of cranial plate, HL cm) of dead individuals was measured using a measuring tape. This measure was used to estimate snout-vent length (SVL cm) since decomposition negatively affects correct measurement of trunk and tail. The relationship between HL and SVL for the four species was calculated by measuring numerous individuals captured in the area and released at the site of capture immediately after measuring. The following equations were computed: for *Melanosuchus niger* $SVL = -4293 + 3927 * HL$ (N = 94, $r^2 = 0.997$, $p < 0.001$); for *Caiman yacare* (DAUDIN, 1802) $SVL = -3126 + 4033 * HL$ (N = 118, $r^2 = 0.993$, $p < 0.001$); for *Paleosuchus palpebrosus* (CUVIER, 1807) $SVL = -3350 + 4121 * HL$ (N = 97, $r^2 = 0.995$, $p < 0.001$); and for *Paleosuchus trigonatus* (SCHNEIDER, 1801) $SVL = 0986 + 3504 * HL$ (N = 121, $r^2 = 0.882$, $p < 0.001$). Analyses were done in the SYSTAT Program (Systat Software Inc., San Jose, California, USA).

Over the period of two years, the author encountered the following dead crocodylian individuals (estimated snout-vent length [SVL] in parentheses): 42 *M. niger* (58.6 - 247.0 cm), six *C. yacare* (68.4 - 89.6 cm), three *P. palpebrosus* (74.9 - 82.4 cm) and three *P. trigonatus* (36.0 - 78.1 cm). The caimans had been killed by gun shots (36), hooks (9), water turbulence near the dam walls (4) and unidentified causes (5).

Most dead Black Caimans were longer than 2.0 m SVL (Fig. 2) and had gun-shot wounds. The estimated maximum SVL of the Black Caimans was 247.0 cm.

Accordingly, all four species of Amazonian crocodylians suffer from contact with people where they share aquatic environments, even though most caiman species do not pose threat to humans. In particular *Melanosuchus niger*, which occupies large rivers and lakes, is hunted by people in the region of the Madeira River. They frequently regard these biggest Amazonian caimans as an imminent danger and kill them, as is known for two large Old World crocodylians, *C. porosus* (WHITAKER 2008) and *C. niloticus* (WALLACE et al. 2011). There are however only marginal reports of illegal hunting of *M. niger* in the Amazon region (RÊBELO & MAGNUSSON 1983; DA SILVEIRA & THORBJARNARSON 1999).

In the Bolivian Mamoré River, which is a tributary of the Madeira River, the maximum total length of *M. niger* was estimated to be 4.94 m based on a head length of 58.8 cm (THORBJARNARSON & MCINTOSH 1987). In this latter study, 52 % of the killed *M. niger* individuals had an estimated total length of more than 4.00 m (i.e., SVL > 2.00 m). In conclusion, with regard to the region of the Madeira River, the conflict between humans and crocodylians is focused on large individuals of *M. niger*.

Most dead caimans had gun-shot wounds, however no meat had been taken from the body. One *M. niger* and one *C. yacare* were lacking tails, indicating that the individuals had been killed (also) for food. Many caimans died because they swallowed hooks or drowned in gill nets. Flooding by the dammed river makes the crocodylians come into closer contact with fishermen and others, which will probably increase conflicts in the future. For the benefit of all parties involved, downstream translocation is thus recommended for caimans approaching hydroelectric dams to prevent the reptiles' deaths both in the area of the turbines and floodgates.

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