With the increasing urban sprawl, habitat loss and pressure on natural resources have become major threats to the biota in many areas. In aquatic environments, intensive fishing, pollution, silting and habitat destruction are problems related to species conservation. The impacts of fishing, which in many cases may occur accidentally, is a problem for many species (Przbylski and Monteiro-Filho, 2001; Monteiro, 2004).

Accidental fishing, or bycatch, is characterized by the unintentional capture of animals other than target fish species in fishing gear such as gill nets. In general there is a negative relationship between the fisherman and the species caught (Aguilera et al., 2008). Often, this fishing activity in continental natural environments is carried out by artisan fishermen, characterized by the small-scale commercialization of fishing for sustenance (Dias-Neto and Dornelles, 1996). When an accidental catch occurs, trapped individuals are released back into the water; but there are reports of fishermen opportunistically slaughtering and consuming the animal caught (Przbylski & Monteiro-Filho, 2001). In other cases, bycatch animals are killed because they have damaged the fishing nets (Aguilera et al., 2008).

The number of records of crocodilians in fishing nets is scarce. This is because many animals are able to escape from nets: smaller individuals pass through the nets and larger animals escape by damaging the fishing gear (Aguilera et al., 2008). In areas of fishing activity where crocodilians exist, the illegal hunt of these animals is very common. They may supply small local markets (Verdade, 2001), or be consumed by the fisherman themselves.

In regions where this pressure exists, animals generally intensify cautious behavior (Ron et al., 1998), which refers to the tendency of crocodilians to avoid approaching humans in areas of great anthropic activity, as described for several species in the world (Webb and Messel, 1979).

We made monthly field surveys between January 2014 and December 2016 to monitor the population of *Caiman latirostris* in the dam reservoir of the Tapacurá River (8°2′39.39″ S, 35°11′44.42″ W) in an area of intense artisanal fishing activity in the municipality of São Lourenço da Mata, Pernambuco, northeastern Brazil. We captured individuals from fishing nets wrapped around their body. We identified the presence of animals by the indirect recording technique, using a light beam to intercept the eyeballs and identify the caiman by the resultant reflection (Magnusson, 1982). In cases where the captures were needed, they were performed using a telescopic rod of 5 meters connected to a locking cable snare at its anterior region. For the containment of animals, insulating tape or silver tape was used to close the jaw of the animal.

We found four animals with their bodies wrapped around by fishing nets on November 2014, June 2015, Abril 2016 and May 2016, three of which were photographed. (Fig. 1). In two cases, young caimans were found with necrotic or already amputated limbs due to the pressure exerted by the fishing nets. Despite this dismemberment, the individual’s survival capacity may not be influenced, for example, one of the caimans was recaptured one year after the first capture and, later, four months after the first recapture. (Table 1).

During the field expeditions, a maximum of 70
individuals were sighted in one night. This probably underestimates the total population in the reservoir, considering that the caimans’ detectability in night counts is affected by enviromental factors (Cupul-Magaña, 2009), such as floating vegetation, temperature and water level (Cherkiss et al., 2006; Da Silveira et al., 2008). These variables can change the enviromental structure, forming refuge areas for the caimans in the water body, where sight of the eye reflection becomes impossible. Based on this, we suggest that fishing activity is not the major threat to *C. latirostris* population in Tapacurá reservoir, due to the low number of animals caught as bycatch in fishing nets.

Crocodilians generally have a generalist diet and an opportunistic predatory behavior, which may explain the presence of these animals near to some fishing nets. *C. latirostris* are not necessarily active predators, having been observed consuming dead or slaughtered food items (Piña and Larriera, 2002), considered as a passive food behavoir (Piña and Larriera, 2003), similar to reports for other species of crocodilians, such as *Caiman yacare* (Schaller and Crawshaw, 1982). Freitas-Filho (2007)

**Figure 1.** Interactions with, and injuries caused by, fishing nets recorded for *Caiman latirostris* in the Tapacurá River reservoir in the municipality of São Lourenço da Mata, Pernambuco, northeastern Brazil, from January 2014 to December 2016. A: Identification of fishing nets in the aquatic environment; B and C: Young females individuals with injuries caused by accidental wrapping on limbs; D: Adult male individual caught wrapped around by a fishing net.
Table 1. Description of interactions with, and injuries caused by, fishing nets recorded for *Caiman latirostris* in the Tapacurá River reservoir in the municipality of São Lourenço da Mata, Pernambuco, northeastern Brazil, from January 2014 to December 2016.

<table>
<thead>
<tr>
<th>Date of recording</th>
<th>Capture Technique</th>
<th>Length Total</th>
<th>Sex</th>
<th>Interactions/Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/21/2014</td>
<td>Manual</td>
<td>45.5 cm</td>
<td>Female</td>
<td>Mesh of the net involving the right anterior limb, strangled at the base of the forearm, and left anterior limb without the hand.</td>
</tr>
<tr>
<td>06/15/2015</td>
<td>Locking cable snares</td>
<td>223 cm</td>
<td>Male</td>
<td>Animal wrapped around by a holding net and removed without presenting body injury.</td>
</tr>
<tr>
<td>04/12/2016</td>
<td>Manual</td>
<td>71.5 cm</td>
<td>Female</td>
<td>Net wrapped around the back, belly, and right and left anterior limbs, causing edema in the limbs due to compression by the net.</td>
</tr>
<tr>
<td>05/11/2016</td>
<td>Locking cable snares</td>
<td>189.5 cm</td>
<td>Male</td>
<td>An animal observed preying a fish in the holding net; at the moment of capture, it was stuck, being removed with pieces of net trapped in the mouth, showing no bodily injury.</td>
</tr>
</tbody>
</table>

states that caimans are found in the large urban center of Rio de Janeiro; in addition, Filogonio et al. (2010), stated that these animals have a great adaptability to anthropic environments. In Tapacurá reservoir, caught fishes in fishing nets are easy prey for caimans, but due to hunting and fishing in this water body, these animals show, in general, an intensified wariness in behavior (Aguilera et al., 2008), tending to avoid the nets and looking for food in distant areas from this anthropic activity, leading us to believe that the accidents only occur occasionally.

In this research, we observed the precautionary, passive and opportunistic feeding behavior of *C. latirostris* corroborating what has already been described for this and other crocodilian species (Ron et al., 1998; Piña and Larriera, 2003; Borteiro et al., 2009). The interaction of *C. latirostris* with fishing activity using holding nets is negative when the animal is trapped or is able to break free with pieces of the net remaining wrapped around its body by the risk of necrosis or loss of a limb, especially in young individuals, either during its feeding behavior or accidentally during its movements and dispersion through bodies of water.

The recording and quantification of these interactions between caimans and fishing activity may aid in the strategic planning for the management of continental reserves, control of the area of their surroundings and income-generating activities compatible with conservation actions in order to minimize conflicts in areas with an overlap between human beings and the fauna.

References


*Accepted by Graham Walters*