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### Giant otters feeding on caiman: evidence for an expanded trophic niche of recovering populations

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## SHORT COMMUNICATION

### Giant otters feeding on caiman: evidence for an expanded trophic niche of recovering populations

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As water along dirt roads in the Pantanal floodplains diminishes, aquatic fauna becomes restricted to shallow pools. At the end of the 2009 dry season, we filmed giant otters living in pools preying on yacare caimans. Such predation has not been recorded in giant otters inhabiting the Pantanal. Individual otters captured sub-adult caimans. The otters did not share the prey, but conspecifics stole it after conflicts. Caiman predation could be related to resource scarcity in these marginal environments. Information on diet and interactions of endangered populations may underestimate their trophic niche when they recover from over-hunting and expand into sub-optimal habitat.

À medida que as águas ao longo das estradas de terra na planície pantaneira diminuem, a fauna aquática se torna restrita às poças rasas do entorno. No final da estação seca de 2009, nós filmamos ariranhas predando jacarés em baías temporárias. Este tipo de predação não foi descrito antes para ariranhas do Pantanal. As ariranhas capturaram jacarés sub-adultos, individualmente. A presa não foi dividida voluntariamente, mas foi roubada por outros indivíduos do grupo, após conflitos. Esta predação pode estar relacionada com a escassez de alimento nestes ambientes marginais. Informações de dieta e interações em populações ameaçadas talvez subestimem seu nicho trófico quando estas se recuperam, após período sem caça, e expandem para ambientes sub-ótimos.

**Keywords:** Ariranha; *Pteronura brasiliensis*; predation; *Caiman crocodilus yacare*; Pantanal floodplains; Brazil

#### Introduction

Giant otters (*Pteronura brasiliensis*) are large social semi-aquatic mustelids endemic to South America. Predominantly piscivores throughout the geographical distribution of the species, their preferred fish are from the orders Characiformes, Perciformes and Siluriformes (Duplaix 1980; Laidler 1984; Rosas et al. 1999; Rosas-Ribeiro 2009). Giant otters take quite large fish (> 30 cm), especially slow-moving species, according to their availability and ease of capture (Duplaix 1980; Schweizer 1992; Kruuk 2006). While some reports indicate that they consume varied foods, such as crustaceans, mollusks, reptiles, amphibians, water birds, and mammals, these represent less than 1% of their diet (Duplaix 1980; Schweizer 1992; Rosas et al. 1999; Rosas-Ribeiro 2009; Cabral et al. 2010; Silva 2010).

Giant otters suffered a drastic reduction in distribution as a consequence of excessive hunting to supply the fur trade during the 1950s and 1960s (Carter & Rosas 1997) and habitat destruction (Schenck 1999). The decrease in demand on the international market, as well the establishment and enforcement of protective laws, allowed recuperation of

some giant-otter populations, noticeably in Colombia (Díaz & Sánchez 2002), Peru (Uscamaita & Bodmer 2009), Bolivia (Van Damme et al. 2002), and Brazil (Schweizer 1992; Ribas 2004; Leuchtenberger & Mourão 2008; Rosas et al. 2008). In Brazil, well established giant-otter populations are limited to the Amazonian and Pantanal basins, and in the latter, groups are widely distributed along the rivers and creeks of the floodplain (Schweizer 1992; Carter & Rosas 1997; Ribas 2004; Tomas et al. 2011).

We present the first record of giant-otter predation on caimans in the Pantanal, which is likely to be due to food limitation of peripheral populations of giant otters that have been excluded from larger rivers by other groups. We also describe behaviors which indicate competitive interactions among group members, rather than cooperative hunting of a preferred prey.

#### Materials and methods

##### Study area

Pantanal, the largest South American wetland, covers 160,000 km<sup>2</sup> of lowland terrain extending from Bolivia to Paraguay and Brazil. The Pantanal is

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recognized by its flatness and low altitude, and suffers alternating periods of flood and drought with strong seasonality (Alho et al. 1988; Harris et al. 2005). The Estrada-Parque Pantanal (EPP) highway is a 120 km dirt road constructed on a causeway 1–2 m above the surrounding plains across a section of the southern Pantanal. It crosses a diverse range of water bodies and marshlands, including streams, lakes, and ponds along the roadside, and trenches originating from the construction of the road (borrow pits). In the dry season (June to December), the availability of water gradually diminishes, and much of the aquatic fauna is restricted to shallow pools in sub-optimal habitat until the next rainy season.

#### **Monitoring of giant otter behavior and vocalization**

We started monitoring giant otters in the southern Pantanal (Mato Grosso do Sul, Brazil) in 2002, and we became aware of marginal populations of giant otters in pools and water bodies around the EPP highway (UTM 21k 0451800 7873700 to 21k 0496300 7831500) in 2008. We do not have records of giant otters occupying borrow pits along roads during the dry season before then. We recorded behavior of giant otters with a digital camera (Sony model DCR-TRV340), and used the sound-tracks of the records to extract the sounds produced by the animals in digital format. Spectrogram and analysis of acoustic variables (frequency of highest energy [FM], and time duration of sound [DT]) were performed using Bioacoustic Raven 1.2 (Cornell Lab of Ornithology, Ithaca, NY, USA), and the vocalizations were classified according to Duplaix (1980).

#### **Results**

We accompanied a group of giant otters from October to December 2009. In the first month, the five adults that composed the group changed their territory and traveled about 6 km through savannas, drying lakes and creeks. In early November, the group won a fight against another large group and conquered a lake of about 0.2 km<sup>2</sup>, incorporating a male and a female of the eight individuals from the other group. During October and November, they preyed almost only on small loricariid catfish (< 20 cm), characteristic of benthic environments. By the end of November, most fish were scarce and the otters dug deep into the mud to catch marbled swamp eels (*Synbranchus marmoratus*, Synbranchidae). In December, at the end of the dry season, we twice registered the group feeding on large sub-adult caimans (*Caiman crocodilus yacare*, Alligatoridae) estimated to be 1.2 and 1.4 m total length, with an estimated mass of 6 kg and 9 kg.

The caimans were captured by individual giant otters, although more than one giant otter was present during the captures. On each occasion, the giant otters began feeding on the back of the caiman's neck (Figure 1). Capture and consumption of the first caiman lasted 53 minutes. The giant otters did not voluntarily share the prey with other members of the group. However, in the first event three individuals fed on the same caiman, which was successively stolen after vocal and/or physical conflicts. The subordinate that hunted and first fed on the caiman, vocalized a growl sound ( $n = 19$ ) when other adults approached him and his prey. The growls had an average FM of 465.6 Hz ( $\pm 267.7$ ) and an average DT of 2.25s ( $\pm 1.33$ ) (Figure 2a). During the last 6 minutes of feeding, the dominant male approached the second subordinate feeding on the caiman and produced long wavering screams ( $n = 37$ ; FM = 2411.9 kHz  $\pm$  492.39; DT = 0.96 s  $\pm$  1.23), apparently soliciting the prey. The average DT of these screams was 1.49 s ( $\pm 1.39$ ), at times interspersed with the HAH call (Duplaix 1980) of a higher frequency ( $n = 23$ ; FM = 3067.29 kHz  $\pm$  520.94; DT = 0.54 s  $\pm$  0.79) (Figure 2b). Vocalization lasted until the theft of the prey.

When we made these observations, the individuals in the group were visibly debilitated, thin, and with the mucous membranes of their anus, mouth and eyes apparently inflamed. One of the lower canines of the dominant male was missing and his carnassials were visibly worn, probably due to the friction with the sand and mud. Despite the fact that they could catch caimans, which were common in the area, we noted that the overall health of the group deteriorated as the dry spell intensified. The otters had taken caimans before. Analysis of feces from the group's latrine collected on November 19 revealed the presence of osteoderms and other remains of caimans, and local residents reported that giant otters had been seen feeding on caiman along the highway since November.

#### **Discussion**

Otters, in general, are highly specialized carnivores with a diet dominated by fish (Kruuk 2006). Nevertheless, there is evidence that high levels of water instability lead to decreased fish consumption by Eurasian otters (Clavero et al. 2008; Román 2010). In eight years and 3000 h of giant-otter observation on rivers with some hydrological predictability, we have seen consumption of prey other than fish only three times, and those prey were crabs (Trichodactylidae).

Even in optimum conditions, caimans compete with giant otters for fish and can be potential predators of their cubs (Schweizer 1992). During the

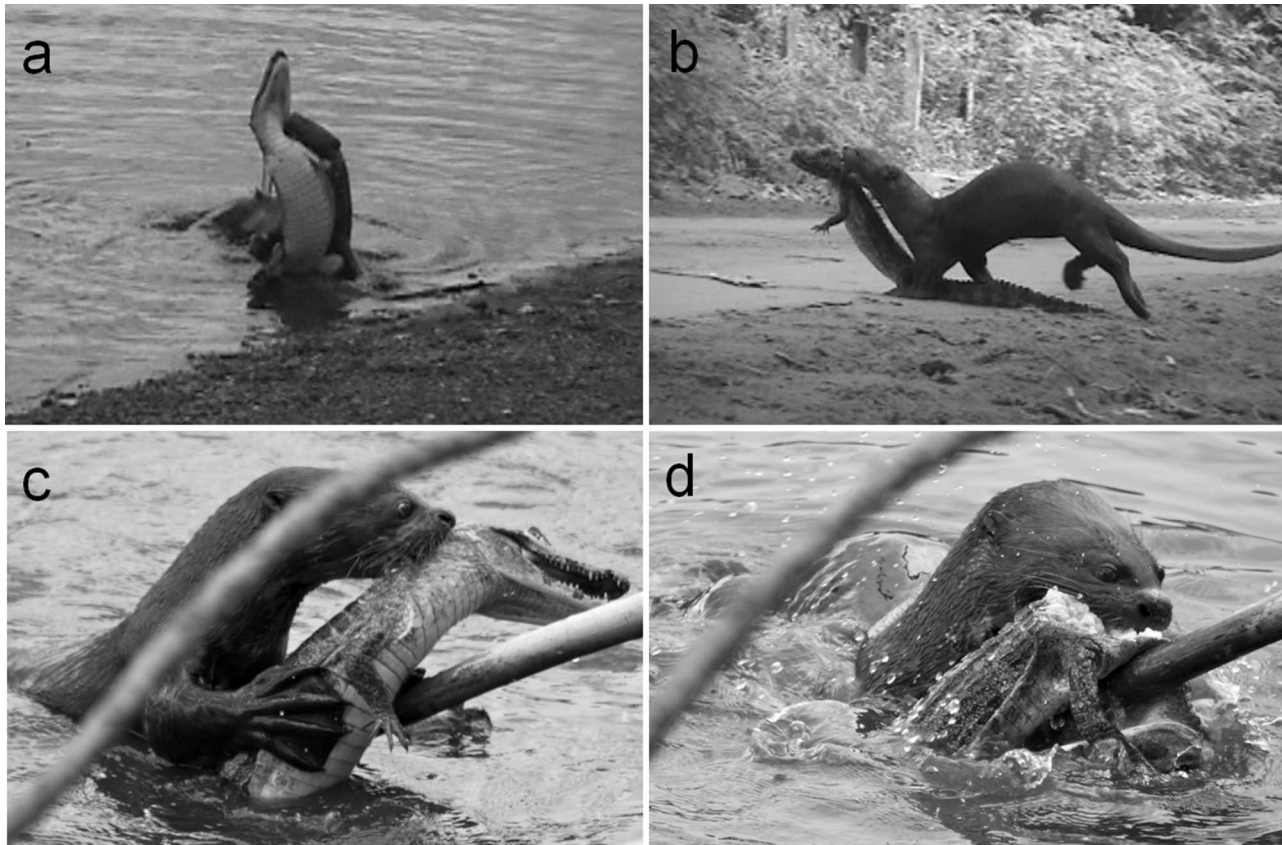


Figure 1. A subordinate giant otter (a) brings the still alive caiman to the shore, (b) crosses the highway, (c) begins feeding on the back of the caiman's neck and (d) eats the caiman.

last two years we registered 12 agonistic encounters between yacare caiman and giant otters in the southern Pantanal. Giant otters generally surround and fence off caimans that get too close to their den entrances and campsites. In six instances, only one giant otter was the aggressor, despite the presence of other members of group. Only once a caiman initiated the aggression, attacking a giant otter about to leave water to go to a latrine. The otters never killed or ate caimans in these cases.

Brecht-Munn and Munn (1988) reported that giant otters hunting cooperatively can kill large prey including anacondas (*Eunectes* sp.) and juvenile black caimans (*Melanosuchus niger*). This did not occur in our observations; each group member hunted its own prey and did not share the prey voluntarily, as do other social carnivores that have cooperative hunting, such as lions and wild dogs (Stander 1992; Creel & Creel 1995).

Because of their high metabolic rate, giant otters need to eat up to 3 kg of fish per day to maintain

their activities (Duplaix 1980; Kruuk 2006). By the end of the dry season, the quantity of fish in the borrow pits along roads is drastically reduced, mainly from the high rate of predation by piscivorous animals, such as birds and caimans. At the same time, the densities of caimans increases as they congregate in diminishing water pools in the flood plains.

Our data suggest that predation on caimans by giant otters along the Estrada Parque Pantanal highway was due to the drought and resource scarcity in these marginal environments. That some groups are occupying sub-optimal habitats, and feeding on prey that normally is not taken, is probably related to the increase in otter density in the Pantanal and suggests that giant otter populations might be reaching their carrying capacity in the southern Pantanal. As otter density increases, and more groups are pushed into marginal habitat, it is likely that their interactions with other species will increase in ways not predictable from data collected from low-density populations in primary habitat.

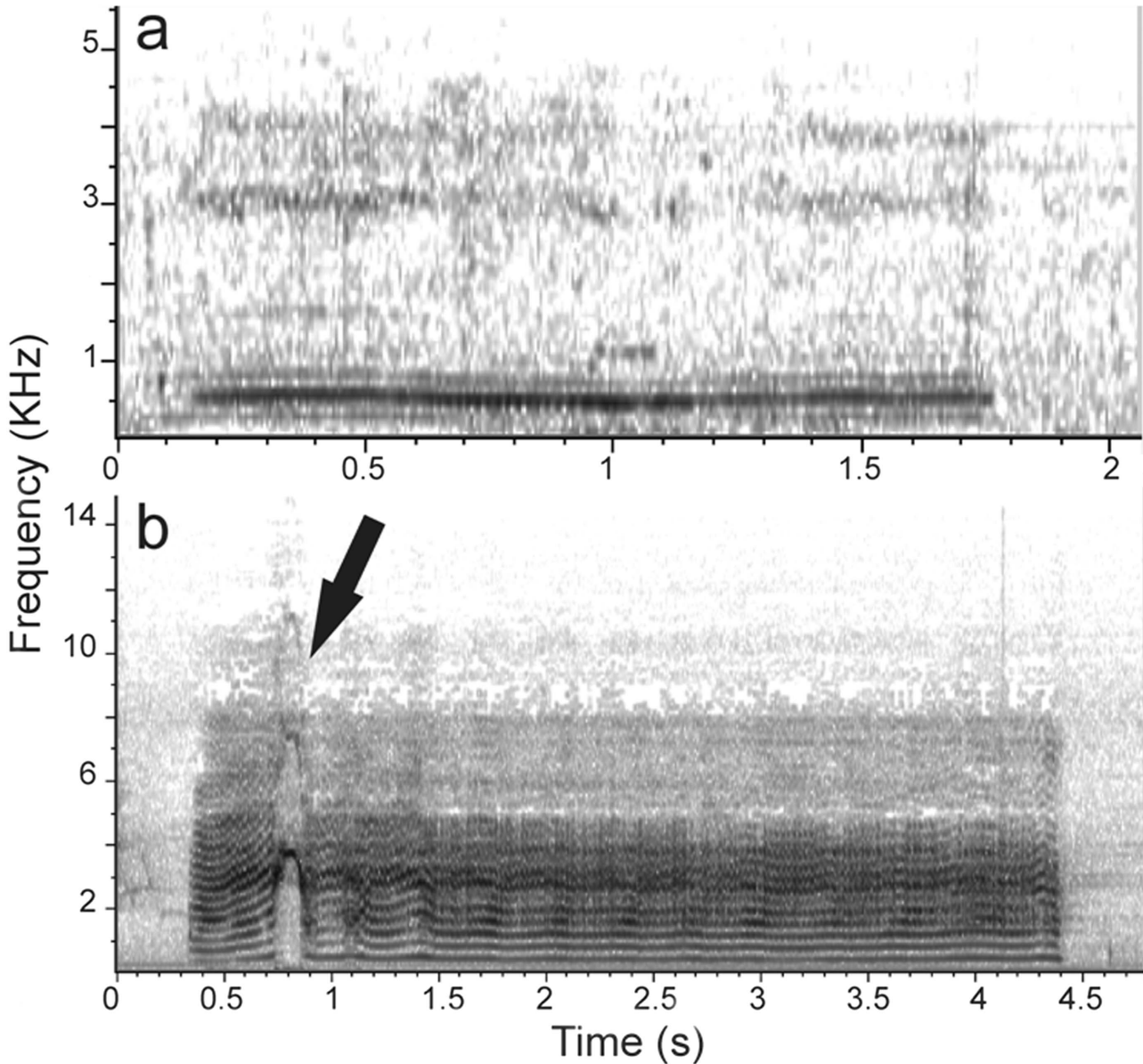


Figure 2. Spectrograms of giant otter sounds vocalized during caiman predation; (a) growl, (b) wavering stream interspersed with the HAH call (arrow).

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