



Negative interactions between giant otters (*Pteronura brasiliensis*) and local fisheries in the Amazon and Orinoco basins in Colombia

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Abstract. The apparent population recovery of giant otters during the last ten years in the Amazon and Orinoco basins in Colombia is creating serious conflicts between local fisheries and this species. This paper presents evidence of conflicts in the Orinoco, Meta and Bitá rivers in the Orinoco basin, in the Inírida and Guaviare rivers, and in the Caquetá, Putumayo and Amazon rivers in the Amazon region. In most cases, fishermen are killing giant otters or are asking the government authorities to take action to reduce their numbers. Preliminary evaluations of giant otter diets indicated little competition with local fisheries. However, areas with more intense conflicts corresponded to regions with strong fishing pressure and bad management practices. We conclude that interference with fisheries by giant otters is relatively low but it is necessary to undertake management of the fisheries in the region to avoid perceived conflicts.

Resumen. La aparente recuperación poblacional de las nutrias gigantes durante los últimos diez años en el Amazonas y Orinoco colombiano está creando conflictos serios entre algunas pesquerías locales y estas especies. Este artículo presenta evidencia de estos conflictos en los ríos Orinoco, Meta, Bitá, Inírida, Guaviare, Caquetá, Putumayo y Amazonas. En la mayoría de los casos los pescadores están matando nutrias en retaliación y solicitan a las autoridades ambientales del gobierno acciones concretas para reducir sus poblaciones. Evaluaciones preliminares de la dieta de las nutrias gigantes muestran poca superposición de ítems alimentarios con las pesquerías. Un resultado importante es que las áreas de mayor conflicto corresponden a aquellas con mayor presión pesquera y malas prácticas de pesca. Concluimos que la interferencia con pesquerías es relativamente pequeña, pero es necesario implementar medidas de manejo pesquero en las regiones de conflicto.

Introduction

Giant otters were severely reduced in density in Colombia and in most of the countries they inhabited during the sixties due to the fur trade (Donadio, 1978; Trujillo *et al.*, 2006). However, during the last fifteen years a recovery of some populations has been reported in the Amazon and Orinoco basins (Botello, 2000; Carrasquilla and Trujillo, 2004; Valderrama *et al.*, 2010), and in neighboring countries, such as Peru and Bolivia (Van Dame *et al.*, 2001; Recharte and Bodmer, 2009). The distributional range of otters has increased and fisheries have moved up streams and along lakes, which generates more interactions and potential conflicts between this species and fishermen (Carrera, 2003; Trujillo *et al.*, 2006; Carrera, 2007; Recharte *et al.*, 2009; Rosas-Ribero *et al.*, 2011). The current distribution of *P. brasiliensis* in the Amazon and Orinoco rivers in Colombia

includes black-water streams and white-water (turbid) rivers, confluence areas, lakes and even rocky areas in the middle of the Orinoco River (Carrasquilla, 2002; Trujillo *et al.*, 2006; Botello, 2009; Suárez, 2010). The apparent increase in giant otter populations is creating conflicts with local fishermen because the latter argue that fish stocks are decreasing quickly in areas where the species is present. This kind of negative interaction between fisheries and aquatic predators is increasing throughout the Amazon, not only with giant otters, but also with river dolphins and black caimans (Bonilla *et al.*, 2008; Trujillo *et al.*, 2010). We have reports of at least six areas in Colombia where conflicts with giant otters are occurring and we present an evaluation of the situation and the actions that local authorities are trying to implement with local communities.

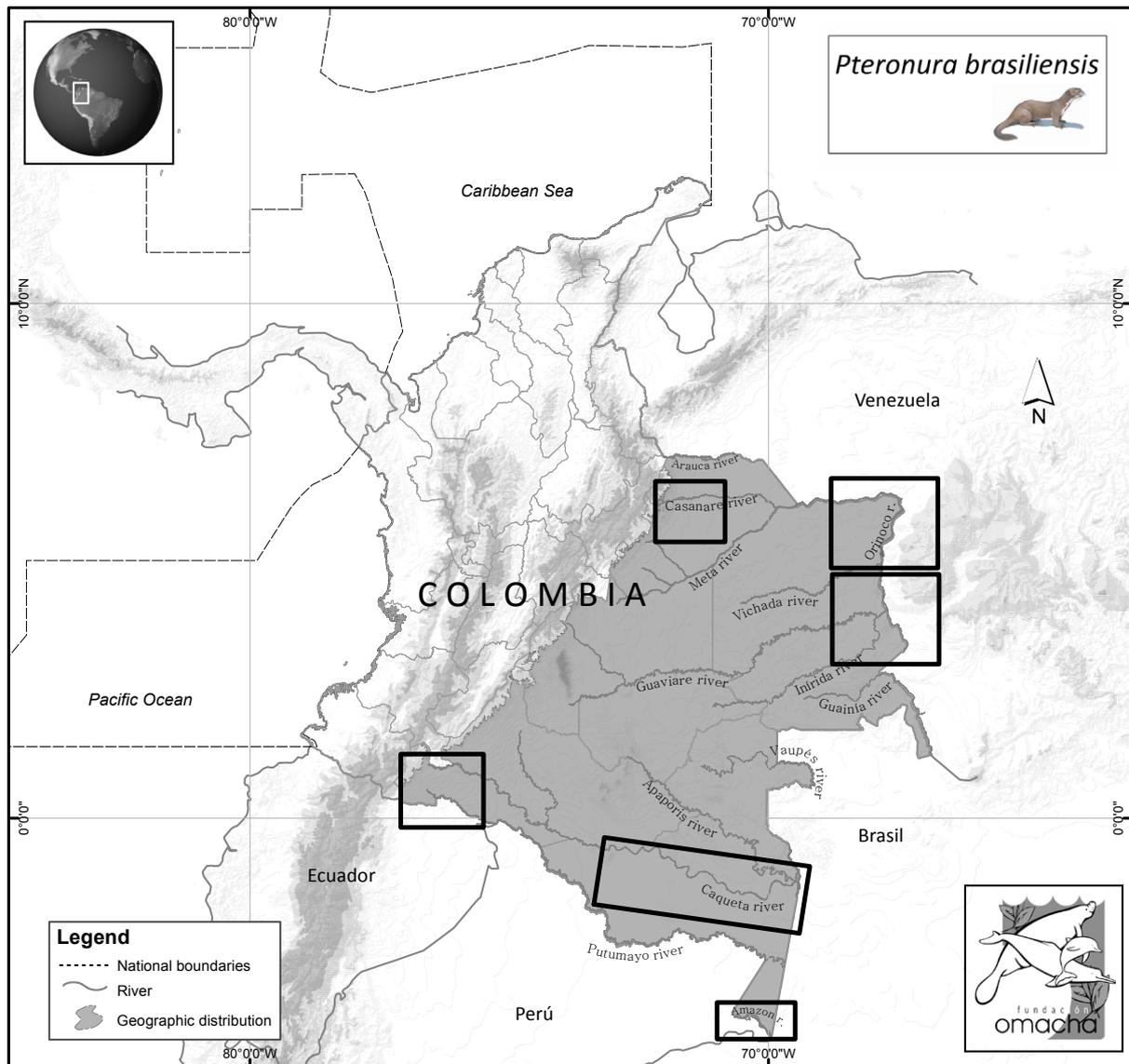


Figure 1. Study area showing the six regions where conflicts between giant otters and fisheries were evaluated

Table 1. Type of conflicts between giant otters and fisheries in the Amazon and Orinoco basins in Colombia

Region	River	Type of conflicts	Description
Amazon	Amazon	None	Numbers of giant otters are very low and no interactions with fisheries have been reported
	Caquetá, including Peña Roja community, and Mirití Parana	Biological and operational	Competition for fish during fishery operations and interactions with hooks and nets
	Putumayo, the area of Tarapaca and La Paya	Biological and operational	Negative interactions with ornamental fisheries (<i>Osteoglossum bicirrhosum</i>) and commercial fisheries
Orinoco	Meta, Bitá and Orinoco rivers	Biological and operational	Conflicts in tributaries and lakes
	Guaviare, Inírida and Atabapo rivers (Inírida Fluvial Star)	Biological and operational	Conflicts with fisheries, killing of otters
	Casanare	Operational	Negative interactions with aquaculture

Material and Methods

Interactions between giant otters and fisheries have been evaluated in six regions of Colombia: three in the Orinoco Basin and three in the Amazon Basin (Figure 1). In the Orinoco, the areas are located at the confluence of the Meta, Bitá and Orinoco rivers in the El Tuparro Biosphere Reserve, the Inírida Fluvial Star that includes the Guaviare, Inírida and Atabapo rivers, and some wetlands and rivers supporting aquaculture in Casanare. In the Amazon, evaluations were made in the Amazon, Putumayo and Caquetá rivers.

This paper used information compiled from various projects undertaken by Omacha Foundation and other organizations, between 2004 and 2011, and that have not been published before. Methods to collect the information were different in each area. Data was collected in the Amazon as part of an evaluation of aquatic species (river dolphins, giant otters, turtles and black caimans) and conflicts with human communities in 2009 and 2010 during the FACUAM project (*Actions for the use, management and conservation of threatened aquatic fauna of southern Colombian Amazon*). This was a large initiative from the Colombian government and two non-governmental organizations (Omacha and Natura) in three rivers of the Colombian Amazon: Putumayo, Caquetá and Amazon. This project involved 4213 people in workshops about aquatic wildlife conservation initiatives. In-depth interviews were made with 38 fishermen and five workshops were conducted with local communities in order to evaluate their perceptions about giant otters. This information was used to construct social maps and lists of threats to wildlife (Bermúdez-Romero *et al.*, 2010). Additionally, seventy surveys for direct and indirect evidence of otters were carried out along 328.3km of the Amazon,

Caquetá and Putumayo rivers (Valderrama *et al.*, 2010).

Surveys in the Orinoco basin were carried out in two areas. Evaluation of habitat use, diet and threats to giant otters have been ongoing in the Tuparro Biosphere Reserve since 1998; fecal samples were collected in order to identify the species and the size of the fish that otters were consuming (Gómez, 1999; Valbuena, 1999; Carrasquilla, 2000; Velasco, 2004; Díaz, 2008; Trujillo *et al.*, 2008). Three separate evaluations were conducted in the Inírida Fluvial Star. The first was undertaken between 2005 and 2006 in response to complaints from local indigenous communities about the increase in the number of giant otters and their negative impacts on fisheries. The second was conducted over six months in 2008 evaluating direct and indirect evidence of giant otters and conflicts with fisheries (Suárez, 2010). The last evaluation was made in 2011 and we consolidated all the information in this area and maps were produced of areas of conflict between giant otters and fisheries (Trujillo *et al.*, 2014).

Anecdotal and opportunistic information were collected in 2009 and 2010 during a mammal survey in the Casanare region (Trujillo *et al.*, 2010).

Available information on fisheries was also obtained from national and regional databases in order to identify changes over the last 10 years in target species and capture volumes in the study areas.

Results

Evidence of biological and operational interactions between giant otters and fisheries was obtained from interviews with local fishermen in five of the six areas (Table



Figure 2. Giant otter pup kept as a pet in an indigenous community in Guainía. The animal died of malnutrition

1). Definitions of these interactions follow Northridge and Hoffman (1999), where biological interactions include competition between giant otters and fisheries for the same prey species, and operational interactions occur when giant otters interact directly with fishing operations, removing fish from nets or scaring the fish.

Amazon Region

Giant otters are scarce in the Amazon River and are mostly found in upstream tributaries, such as the Loreto Yacu, Atacuari, and Amacayacu and Matamata rivers. The low numbers may be a result of the high hunting pressure during the 1950s and 1960s as the town of Leticia, in the middle of this area, was one of the most important centers of fur gathering (Donadio, 1978). There were no reported interactions between fisheries and otters in this region.

Conflicts were reported in two areas of the Caquetá River, one close to the town of Aracuara in the indigenous community of Peña Roja, and the other in the Mirití Parana River. In both cases, almost 70% of fishermen claimed that giant otters scare the fish from lakes and fishing areas. This percentage of the fishermen also argued that otters remove fish from nets and hooks. In retaliation, some of them killed otters, especially adults, and they collected pups as pets for the communities. In most cases (94%) these pups died due to the lack of proper care and food and sometimes they were

just killed (Figure 2). Despite the fact that most fishermen ($n = 235$, Figure 3) had negative perceptions about giant otters, the traditional beliefs of indigenous communities (Nonuyas, Andoques, Matapies and Yukunas) hold that this species is important for the equilibrium of the aquatic world. They even consider the origin of giant otters as a mechanism to control diseased fish (Matapi *et al.*, 2008).

On the Putumayo River, evaluations of conflicts were undertaken in two main areas. The first was located on the Caucaya River and La Paya Lake in a tri-border zone between Colombia, Peru and Ecuador. There, conflicts occur between giant otters and commercial and ornamental fisheries. Fishermen argued that otters hunt the silver arowana (*Osteoglossum bicirrhosum*), and that this makes capture of juveniles for the ornamental fish trade difficult. This conflict has been reported for regions in Colombia and Peru, and has been treated in several projects such as *FACUAM*, *Putumayo three frontiers program* and *Aquatic threatened fauna in the Colombian Amazon* in which 53 meetings were carried out involving fishermen between 2008-2012 (Trujillo *et al.*, 2008; Bermúdez-Romero *et al.*, 2010). In the Guainía and Amazon states in Colombia, fishermen sent inquiry letters asking the Government to reduce the number of otters. This situation encouraged local environment authorities to undertake evaluations of giant otter populations.

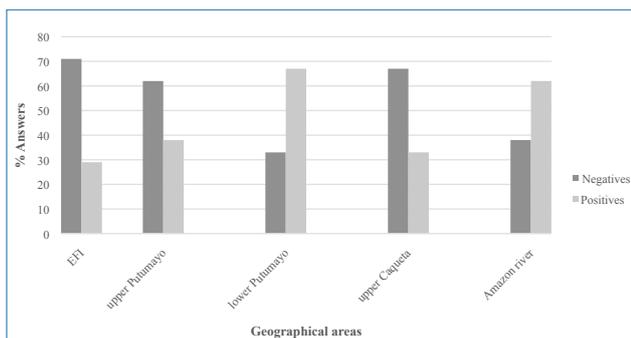


Figure 3. Fishermen negative and positive perceptions towards giant otters in four geographic areas of Colombia. EFI: Fluvial Star of Inírida-Guainía (n = 48), Caquetá (n = 23), Putumayo (n = 63) and Amazon (n = 101)

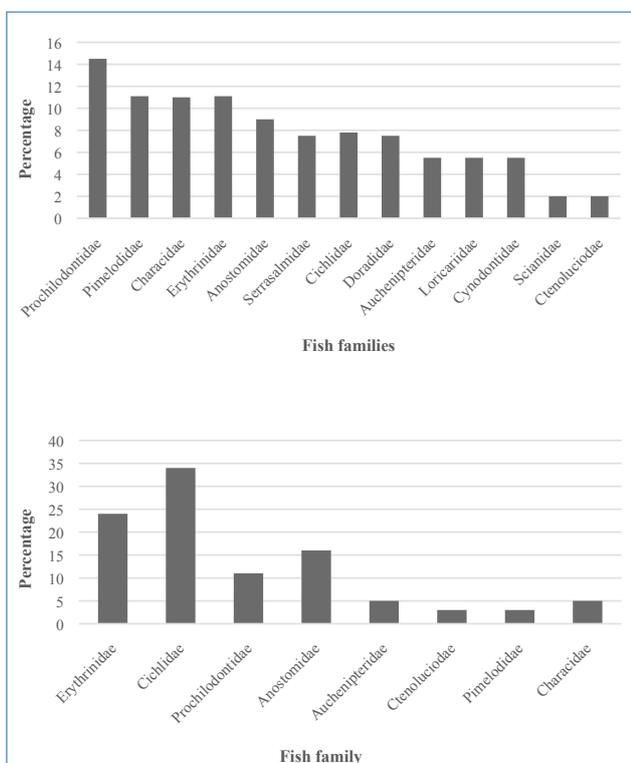


Figure 4. Diet of giant otters in the Inírida Fluvial Star. a) Puerto Carreño, b) Puerto Inírida (based on Carrasquilla and Trujillo, 2004 and Velasco, 2005)

Orinoco Region

Conflicts were reported in the three areas in the Orinoco Basin. In the Tuparro Biosphere Reserve, fishermen in the Meta and Bitá rivers reported an increase in the number of giant otters. The conflicts appear to be biological and operational because otters eat some of the important fish used by the local people for subsistence, especially fish from the families Prochilodontidae (*Prochilodus mariae*), Erythrinidae (*Hoplias* sp.), Pimelodidae and Characidae (Figure 4). Six cases of retaliation have been reported for the Juripe and

Bitá rivers, where fishermen usually killed adults and kept the pups as pets. During the last 10 years, five pups have been rehabilitated in the area (Gómez *et al.*, 1999).

In the Casanare region, little research has been conducted specifically on giant otters, but recently surveys to describe the situation of mammals in this area showed conflicts between this species and aquaculture initiatives on the Andean border of the Orinoquia (Trujillo *et al.*, 2011). At least five farmers (41.6%) expressed their anger towards the presence of giant otters and pay people to shoot and trap these animals in order to prevent attacks on their fish.

In the Inírida Fluvial Star, there appears to be more conflicts because, during the last six years, the indigenous authorities of Puerto Príncipe and Yuri communities have pressured the environmental authorities to reduce the number of giant otters. They argue that there are large groups of otters in most tributaries and lakes and that the fisheries are severely affected by these animals¹. Very low densities of giant otters were found during field surveys undertaken in 2005 despite the fact that we included some of the fishermen who made complaints and described large groups and densities of otters. Most of the indirect evidence was found upstream far away from human communities. Eighty-three fecal samples were collected showing eight main families of fish with a higher percentage of Cichlidae followed by Erythrinidae and Anostomidae (Figure 4). Most of these species were under 20cm of length (estimation based on fish mandibles and linear regressions of mandible length and standard length of measured fish), which represents only a relatively small amount of the target fisheries from local communities. In 2007, 210 linear km of main rivers and tributaries were sampled to identify areas with giant otters. Thirty-six individuals in eight groups were found in the area (Suárez, 2010). An update of the situation of giant otter in this region was made during two months in 2011. During this time, five indigenous communities (Puinave, Kubeo, Tucano, Kurripaco and Piaroa) and four farms were visited to evaluate the perception of and conflicts with giant otters. During 2007, the groups were reported to remain almost the same with two observed dispersers (individuals that left their natal groups) (Suárez, 2010). The negative perception towards giant otters has been expressed frequently over the last few years and more fishermen are asking for a culling of otters and have even proposed the opening of a pelt trade, a situation that is legally prohibited. Fishermen claim that fish stocks are collapsing due to the high number of giant otters, a situation that is not supported by the counting and the indirect evidence of this species in the area. Also, fishermen claim that otters attack fish traps called *cacures* and

¹Garrote, G. (2006) *Evaluación preliminar del conflicto nutria gigante (Ptenonura brasiliensis) - pescadores indígenas en la comunidad Puerto Príncipe (Puerto Inírida-Guainía)*. Corporación para el Desarrollo Sostenible del Norte y el Oriente Amazónico (CDA)- Fundación Omacha. Informe Técnico, 16 pp.

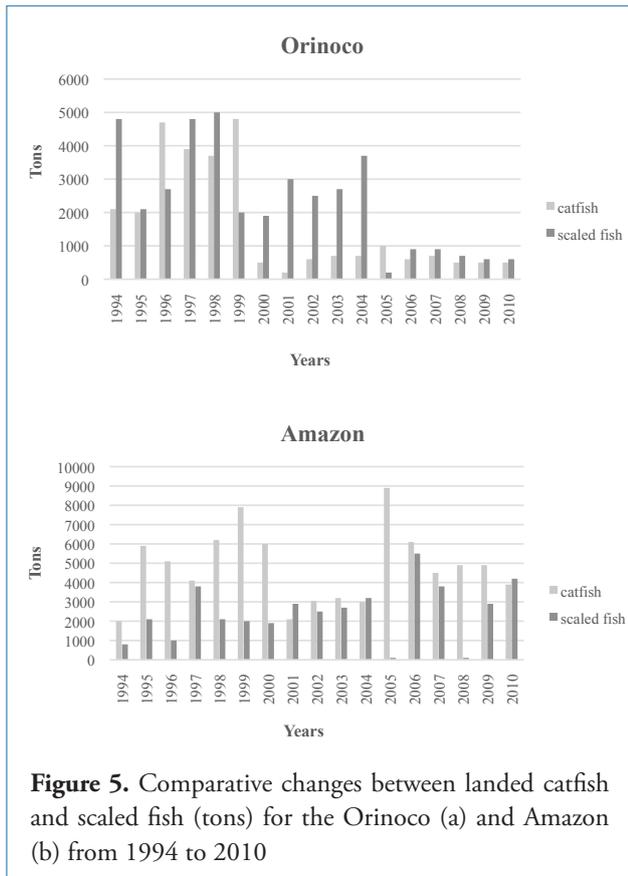


Figure 5. Comparative changes between landed catfish and scaled fish (tons) for the Orinoco (a) and Amazon (b) from 1994 to 2010

nasas in addition to nets. *Cacure* traps are made with thin sticks, forming a heart-shaped enclosure with a small entrance from which fish that are trapped cannot return. *Nasa* traps are made from a conical basket made of bark (Ramírez-Gil and Ajiaco-Martínez, 2011).

Fisheries

In four of the six areas where conflicts between fisheries and giant otters have been reported, fishing is an important economic activity, and the target species are similar (Fabrè and Alonso, 1998). Catfish have been the main target species in these areas since the eighties, and the fisheries occurred mainly in large rivers such as the Meta, Orinoco, Guaviare, Putumayo, Caquetá and Amazon (Petrere *et al.*, 2005). The tributaries and lagoons are ecosystems where local people collect fish for their own consumption. However, a significant decrease in capture volumes of catfish has been evident during the last eight years mainly in the Orinoco region (Figure 5a), and the consequence of this was the re-orientation of the fisheries toward the fishes used for local consumption, thus affecting food security for local people. This situation created several conflicts between communities and fish traders that have been complaining to government authorities. In the Amazon the pattern is a little different, with a decrease in capture of catfish from 2002 to 2004 but increasing again from 2005 mainly because of the mota fish trade from Brazil

and Peru (Figure 5b).

In the Amazon region, the main areas where conflicts occurred correspond to the Caquetá and Putumayo rivers, where the fisheries were based mainly on catfish. Nevertheless, during recent years, people are trading more fish from the families Characidae, Curimatidae, Prochilodontidae and Anostomidae that traditionally were used for local consumption. Indigenous communities have alerted environmental authorities about this situation and in some cases fishery agreements have been proposed (Bermúdez-Romero *et al.*, 2010; Valderrama *et al.*, 2010). One of the main problems is that reproductive migrations of fishes are interrupted by large nets blocking confluences and tributaries, which reduce fish recruitment. Additionally, fishermen need to move farther away from riverine towns looking for undisturbed areas (areas that often correspond with giant otter territories) for fish.

In the case of the Meta, Orinoco and Bitá rivers the conflict centers around the interest of commercial, ornamental and sport fisheries. All three fisheries generate important income for the region and the country. Sport fisheries claim that the lack of management of commercial fisheries on the border between Colombia and Venezuela encourage bad fishing practices which include the use of large nets in rivers, such as the Bitá, where sport fishermen catch *pavones* (*Cichla* sp) and other fishes. As the capture of catfishes decreased, the pressure has increased on characins and cichlids that are sold in Venezuela. In order to catch these species the fisheries have moved their target areas to small tributaries and lakes, where the probability of interactions with giant otters increases. Unfortunately this situation has not been well documented despite complaints from local communities.

A similar situation occurs in the Inírida Fluvial Star where the fisheries for catfish have been reduced dramatically in their catches and the fisheries have now changed their target species to characids and cichlids that have a viable market in Venezuela. This situation is affecting food security and cultural features of indigenous communities, because most of them catch and sell fishes in the frontier cities and then with the money buy cans of tuna fish for their families (Trujillo *et al.*, 2003).

Discussion

There have been reports of conflicts between giant otters and fisheries throughout their geographic range (Gómez and Jorgenson, 1999; Carrera, 2007; Recharte *et al.*, 2009; Rosas-Ribeiro *et al.*, 2011). In most cases, local people claim that giant otter numbers have increased and that there are large groups in fishing areas. These conflicts may be summarized as predation of fish (biological interaction), interference with the fishery by scaring the fish in the areas where fishermen are present (interference), and damaging fishing equipment including nets, traps and hooks (operational interaction).

Overfishing is reducing stocks and has increased the area

that is fished. Our direct observations during the last eight years showed that fishermen are moving from white rivers to areas where this species traditionally resided (black waters) rather than the giant otters expanding their home ranges. For this reason, the frequency of interactions between humans and otters has increased, as Carrera (2007) and Recharte *et al.* (2009) pointed out for other areas of the Amazon.

Giant otters and other piscivores are unjustly being blamed for the overfishing. This blaming of the giant otters for the reduction of fish stocks is probably over-exaggerated by fishermen and may be an excuse to avoid the implementation of fisheries management plans and the endorsement of national fishery regulations and local agreements. This situation has been discussed several times during management workshops in the Colombian Amazon between policy makers, non-governmental organizations and local communities, and corresponds to an increase in fishery products demand in the cities, more people and towns being established along the riverbanks and the collapse of fisheries in several places. In fact, there are areas where the fisheries have collapsed and there is no evidence of the presence of giant otters or even river dolphins (*Inia geoffrensis*), another species that has been identified by fishermen as a competitor (Trujillo *et al.*, 2014). The situation of the fisheries along the Amazon is starting to be critical and needs to be addressed as a priority by all governments in the region. Additionally, trans-boundary conservation strategies need to be designed, as has been proposed by several authors (Pinedo and Soria, 2008; Barletta *et al.*, 2010).

Another major problem is the change in target species in the fisheries. Large catfish were the main target species for almost two decades, but recently the target species have changed and now include scavenger fish that formerly were rarely eaten in the Amazon. An example is the case of the mota fish (*Calophrys macropterus*) that now represents more than 40% of the commercial fisheries in countries like Colombia and is being exported to large cities in different countries where consumers have no idea what they are eating (Trujillo *et al.*, 2011). In most of the evaluated areas where conflicts were reported, commercial fisheries are focusing on fish species that in the past were only used for subsistence consumption. Indigenous people in these areas recognized that in the past there was no conflict between humans and otters because there were enough fish for all. Now the situation is quite different with overfishing, fishermen moving up streams and the use of massive fishery equipment such as driftnets (instead of hooks), traps, harpoons and arrows. Overfishing and the change of species for commercial fisheries are compromising the livelihoods of indigenous people (Ruffino, 2005).

The case of arowana fish is a clear example of how the economic pulses in the Amazon create new pressures on specific resources. The harvest of arowana has been dramatically reduced recently in different geographical

areas, and as Recharte *et al.* (2009) state in the case of Peru, it is more likely that overexploitation for the aquarium trade is the primary cause of the reduction rather than predation by giant otters. For this reason the solution is a regulation of the fisheries rather than predator control.

Another pattern in all these areas is that fishermen are asking the government to take action to reduce the number of otters. Therefore, it is a priority to undertake robust evaluations of giant otter populations in all these areas, involving local people and training them for monitoring of otter populations. Additionally, further actions to evaluate fisheries and promote management plans should be undertaken before it is too late for fisheries and giant otters.

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