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# The piracatinga (*Calophrysus macropterus*) fishery and its impact on river dolphin conservation: an update

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River dolphins in South America face a high number of threats, most of them of anthropogenic origin (Trujillo *et al.*, 2010). Among those, the most worrisome are the negative interactions with fisheries and the illegal capture of individuals for use as bait in piracatinga *Calophrysus macropterus* fishing (Estupiñán *et al.*, 2003; Flores *et al.*, 2008; Gómez *et al.*, 2008; da Silva *et al.*, 2011; Alves *et al.*, 2012; Brum *et al.*, 2015; Iriarte & Marmontel, 2013; Mintzer *et al.*, 2013). This is one of the reasons why recently the IUCN changed the threat category for *Inia geoffrensis* to Endangered (EN) (da Silva *et al.* 2018a).

Dolphin bycatch is reported in all countries where Amazon River dolphin *Inia geoffrensis*, Bolivian bufeo *I. boliviensis* and/or tucuxi *Sotalia fluviatilis* occur; however, a full impact assessment has not been carried out, and no consolidated figures are currently available. This impact is related to overfishing in Amazonia and Orinoquia, where both large- and small-sized catfish and characids represent the main targets of commercial fishing (Barthem & Goulding, 2007). The high demand for fish meat has caused the fishing effort to increase, negative interactions with dolphins becoming more frequent. Death of river dolphins in fishing nets has been reported in Bolivia (MMAyA, 2012), Colombia (Trujillo *et al.*, 2010a) and Brazil (Marmontel, unpubl. data). In some cases, dolphins are killed due to their (supposed) competition with commercial fisheries.

Being large catfish overfished throughout the Amazon and Orinoco, smaller species and/or species positioned lower in the food web (detritivores, herbivores) are increasingly targeted, a phenomenon called “fishing down the food web” (Pauly *et al.*, 2000). These species now meet the increasing demand for fish meat. One of these smaller species is *Calophrysus macropterus* (blanquillo in Bolivia, mota or zamurito in Colombia, Ecuador and Venezuela, simí or mota punteada in Peru, piracatinga or douradinha in Brazil). This scavenger species became target of a specialized fishery, using a new fishing method, in which the fish are attracted to submerged cages (or corrals) using bait. This change of target species in the fishery would seem harmless, but what generated a serious problem in terms of conservation was that occasionally meat of river dolphins and caimans was used as bait.

The piracatinga fishery triggered the illegal hunting of an unknown number of pink river dolphins *Inia geoffrensis* and black caiman *Melanusuchus niger*. In just one small area of Brazil, researchers estimated a number of more than 1,000 dolphins hunted each year (da Silva *et al.*, 2011). This generated an important reaction from the scientific community, which at that time estimated that this activity constituted the greatest threat to river dolphins, drastically reducing their populations in areas such as Mamirauá (da Silva *et al.*, 2018b). In some other Amazonian countries, similar trends were observed.

In the light of the foregoing, this paper reviews the current status of this fishery and its impact on dolphins in countries of the Amazon and Orinoco basins.

## **Brazil**

Piracatinga began to appear in the official records of Brazilian fisheries statistics in 1998, as a result of a growing demand from the Colombian market, boosted by the reduction of stocks of capaz fish (*Pimelodus grosskopfii*) in the Magdalena River (Perez, 2018). The first records came from the monitoring systems of Mamirauá Sustainable Development Reserve, where dolphin and caiman meat were being used as bait (Estupiñán *et al.*, 2003, Silveira & Viana, 2003). By 2013, a substantial decrease in dolphin abundance had been identified in the Mamirauá sector of the reserve (da Silva *et al.*, 2011, Mintzer *et al.*, 2013). In addition to evidence of fraud in the selling of “douradinha” in December 2013, the Amazon State Public Prosecutor opened a public civil inquiry and recommended the ban of that activity. As a result, the Brazilian Ministry of the Environment and Ministry of Fisheries issued a 5-year moratorium on the fishery and trade of *C. macropterus*, to take effect in January 2015 (Instrução Normativa Interministerial n° 6, of July 17, 2014).

When the ban on the capture, transport and trade of piracatinga began, data on the activity disappeared from the statistical records, due to the criminalization of the fishing practice. However, *C. macropterus* fishing continued to be carried out and the species was traded under a different name or hiding. The riverside communities that had accrued an improvement in their income through piracatinga fishing were directly affected by a 50% reduction in the piracatinga price paid per weight. As a consequence, there was an immediate increase in piracatinga capture to maintain the source of income. This stimulated the poaching of dolphins and caiman, generating an unforeseen side effect of this legal measure. This trend was reversed only when the Colombian government established a moratorium on piracatinga fishing and commercialization in the country, in August 2017 (Perez, 2018).

In spite of the existence of the recent ban on the capture and commercialization of piracatinga in Brazilian territory, there is evidence that this species is still being commercialized. In 2019 law enforcement operations “Mota” and “Catena” were carried out, during which 2,454 kg and 9,620 kg of piracatinga, respectively, were confiscated in the Tabatinga area (Leandro Aranha, IBAMA, pers. comm. to MM, dec. 2019). It is not clear whether dolphins or other types of bait were used to obtain these volumes of fish. The Tabatinga area borders Colombia, and it seems likely that the fish seized were destined for this country. Brazil has a large border area with Colombia and Peru, and controls between these countries are very limited. This means that there may be an illegal market for piracy despite existing bans. In operations carried out in the

area of Manaus and Manacapuru, 60 kg of piracatinga have been seized (Leandro Aranha, IBAMA, pers. comm. to MM, dec. 2019). At first sight this does not seem to be much, but it shows that fishers continue capturing the species, and traders keep on distributing it in local markets and restaurants in the form of fillets, under the name of “douradinha”.

As recently as early 2020, piracatinga corrals have been spotted in communities along the Solimões and Japurá rivers, on the borders of Mamirauá and Amanã sustainable development reserves, and demand for caiman as bait has increased. Piracatinga fishing is said to never have stopped in Nova Macedônia and Cuiu-Cuiu indigenous communities of Amanã SDR. In an attempt to circumvent law enforcement, fishers seem to be replacing the traditional, more conspicuous, corral with the canoe as a capture technique (Botero-Arias *et al.*, 2014), which would be much more difficult to identify as illegal fishing.

One of the major concerns in Brazil is that the moratorium has already expired and there seems to be no intention by the new government to reinstate it. MAPA (Ministério da Agricultura, Pecuária e Abastecimento, or Ministry of Agriculture, Livestock and Supply) has made two attempts to organize meetings with different actors to discuss the issue in March 2020, but both have been cancelled/postponed. This situation could again trigger the piracatinga fishery both for shipment to Colombia, and for a national market directed to cities in several regions of Brazil, as previously reported. The main problem in monitoring this is that the piracatinga is filleted or cubed, and to identify it requires the use of visual guides (Nunes *et al.*, 2017) or, more likely, molecular procedures (Carvalho *et al.*, 2011).

## Colombia

In Colombia the fishery for capaz, originally from the Magdalena River, collapsed due to depletion of stocks. This species was of great commercial importance in the country and constituted one of the emblematic dishes for consumption during Holy Week. At that point, around the year 2010, Colombian merchants decided to focus their fishing effort instead on the mota or piracatinga fish, which has meat very similar to capaz, in order to guarantee economic flow. It is important to mention that until that date there was no interest in the consumption and trade of piracatinga, because of its scavenging habit, locally known as "corpse eating". However, what started as a local fishery in response to a domestic demand in Colombia, very soon expanded to an industrial fishing activity supplying larger markets, including in Brazil and Peru.

Colombia undoubtedly played a definitive role in stimulating demand and creating the market for piracatinga, and became the first commercial destination for this fish species. The border areas with Brazil, Peru and Venezuela were the main entry points for piracatinga. However, in 2016 all supermarkets in Bogotá ceased selling this species based on the high mercury content detected by the Omacha Foundation, the University of the Andes, the Amazon Research Institute and INVIMA (Nuñez-Avellaneda *et al.*, 2014; Salinas *et al.*, 2014). Since then, supermarkets have not received the fish among their products. In 2017, the National Authority of Fishing and Aquaculture (AUNAP) issued a resolution banning the commercialization of piracatinga in the whole country. This resolution was passed due to the high levels of mercury in this fish, whose consumption was considered a threat to public health. This measure was socialized in the main fishing and marketing points of the species.

Following the 2017 ban on trade in piracatinga, AUNAP has conducted inspections in port areas and markets in major cities. In these controls, the sale of piracatinga has been detected sporadically, mainly during the Easter season. However, in the first months of 2020 a significant increase in the entry of piracatinga from Brazil has been reported by local fishery authorities, apparently in response to the end of the moratorium in that country. This has generated great concern among fisheries authorities in border areas as they try to control this illegal trade.

## **Bolivia**

Until 2010, *C. macropterus* (local name blanquillo) was a species of little importance in commercial multispecies fisheries in the Bolivian Amazon (Van Damme *et al.*, 2011). Till 2013, it represented less than 3% of total commercial landings in the Mamoré, Beni and Iténez Rivers (Van Damme *et al.*, 2011; Doria *et al.*, 2015). After 2015, fishing for this species has developed in the upper basin of the Mamoré River and its tributaries, using meat waste and viscera of domestic animals (poultry and cattle) and, occasionally, wildlife (capybara, caiman, and river dolphin) as bait (Escobar *et al.*, 2020). An analysis of perceptions carried out in the Mamoré River basin in 2016 showed that the Bolivian bufeo was occasionally killed for bait in this region, mainly by unorganized fishers whose activity is difficult to control (Córdoba-Clavijo *et al.*, in prep.).

A study of the blanquillo value chain showed that the supply of the species in the markets of Cochabamba town increased from approximately 0.5 to 5 tons per year in the last five years; the species is also illegally offered in the markets of smaller cities in the lower parts of the Amazon (Córdoba Clavijo *et al.*, in prep.). The main landing point is Puerto Villarroel, on the Ichilo River (a tributary of the Mamoré River and the main fishing area for blanquillo), but other landing points are scattered along the tributaries of the Mamoré River. In the Ichilo River, the species is mainly caught during the highwater period (November to February), when a legal ban on commercial fishing comes into place. There are indications that the species is also caught in the middle basin of the Mamoré River, where the main landing point is Trinidad, and that from there it is transported to Cochabamba. Local organized fishers in the Mamoré basin often tend to use meat from poultry and cattle brought from Santa Cruz as bait, whereas illegal fishers use more often wildlife meat (Córdoba-Clavijo *et al.*, in prep.).

There is a slight trend towards a decrease in the abundance of Bolivian bufeo in the Ichilo River, but more data are needed over consecutive years to verify if this negative trend is significant. Applying the precautionary principle, efforts are being made to prohibit fishing for blanquillo at the national level. Also, new actions were proposed in the II Action Plan for the Conservation of Bolivian bufeo, which is in the process of being finalized, aiming at the conservation of *Inia boliviensis* and the regulation of the capture of *Calophrys macropterus*.

Blanquillo is consumed in national markets, and so far, is not exported to neighboring countries. There is no specific legislation governing fishing for blanquillo. The only reference document is a letter sent by the governor of Cochabamba to the SENESAG (National Health Service) office of Trinidad, announcing that the transport of blanquillo meat in the department of Cochabamba is prohibited, justifying this prohibition by the protection of aquatic and

riverine wildlife, and with the clear intention of stopping the commercialization of blanquillo originating from Trinidad. In fact, the SEDAG-Cochabamba (Departmental Agricultural Service), the agency in charge of controlling fishing, prohibits both capture and commercialization of blanquillo in markets in the department of Cochabamba. This control is deficient and the species keeps on being commercialized at low prices in the peri-urban markets (Córdoba-Clavijo *et al.*, in prep.).

The concentration of mercury (Hg) in blanquillo meat was analyzed to verify if consumption of this fish might represent a risk for human health (FAUNAGUA, unpublished data). Eighty percent of the individual values turned out below the risk threshold established by the WHO, therefore not considered sufficient to prohibit or discourage blanquillo consumption.

## Peru

Official information from national landings shows that the trend in mota landings is increasing since the last decade, with figures of 331 tons during 2016 (García-Dávila *et al.*, 2018). *C. macropterus*.

Just in Ucayali, mota presented an exceptional landing over time, in the last 10 years its catch remains high with an average of 195 tons, observing in that period the maximum landing in 2013 with 373 tons, which represents the highest catch of speck in the Peruvian Amazon (García-Dávila *et al.*, 2018). Mota may not be one of the most commercial ranked species in Loreto and Ucayali but shows a significative increasing in the last few years (García-Dávila *et al.*, 2018).

The rivers with highest incidence of mota fishing between 2012 and 2019, according to data on fishing landings registered by the Regional Production Directorate of the Loreto Region (DIREPRO Loreto), are the following: Ucayali, Marañón and Amazonas (in that order). Other key areas, but with lower frequency of mota in their landings are the Canal of Puinahua, Putumayo, Napo-Curaray, Tapiche, Huallaga, Yavarí, Cahuapanas, Tigre, Potro, Pastaza, Blanco, Paranapura, Mazán and Nanay.

There is limited information on the use of dolphins as bait in Peru. In 2010 and 2015 ProDelphinus, with the support of Duke University, Oak Foundation, and WWF Peru, used rapid assessment surveys to identify and evaluate threats to river dolphins distributed in Peruvian waters and identify priority areas for study and conservation. Questionnaires were applied in 12 fishing ports in the Peruvian Amazon, interviewing a total of 162 and 251 fishermen in 2010 and 2015 respectively, as well as 118 other community members. The results showed that most fishermen associate river dolphins with fishing conflicts, usually related to entanglement and damage to fishing nets. The results also indicate that the practice of using river dolphins as bait began at least in 2010, spread during 2015, and currently prevails in some parts of the Peruvian Amazon (Caballo Cocha, Bagazán, Requena, Calleria).

Between 2016 and 2017, the Solinia Association and World Animal Protection (WAP) started a research project called “Los Bufeos y la Pesca” which aimed at assessing fisherman-dolphin conflicts through the application of surveys, in some strategic cities of the northern Peruvian Amazon (Gillemán & Zumba Arimuya, 2018): Caballo Cocha, Pebas Tamshiyacu, and Indiana (Amazon River); Nauta (Marañón river); Requena (Tapiche River); Mazán (Napo River); and

Iquitos and nearby communities. Based on 529 interviews, it was found that mota fish was sold and consumed in all of the listed communities. The bait used to catch mota was: fish (36%), beef and pork (28%), and river dolphins (11%). Additionally, a minimal percentage of caiman (6%) and other species such as dogs, cats, manatees and even jaguars, were used as bait. According to the surveys, a large part of the “moteros” (local name for the fishermen or boats that fish for the piracatinga) send the fish to Colombia, especially through the lower Amazon (Caballo Cocha, Pebas, Mazán/Indiana and Iquitos). It is important to note that most of these exports are not formal and are not declared.

In 2013, an assessment was conducted on the capture of river dolphins for the piracatinga fishery in the Javari River (Hernández, 2013), on the Peruvian-Brazilian border. It was found that the activity was present in this area, practiced particularly by fishermen from Israeli communities on the Peruvian side. Recently, WWF Peru conducted another assessment in the area, and found that out of 55 fishermen interviewed, five acknowledged being exclusively “moteros”, while others captured mota occasionally or opportunistically (Tejeda-Gómez & Hernando-Bottle, 2020).

There is evidence that the extraction of mota in communities in the Marañón (Nauta) and Ucayali (Requena) rivers is also for national markets (especially in the Andes), with internal exports to the cities of Pucallpa, Yurimaguas and Tarapoto. There is evidence that fishing for the piracatinga is done in an artisanal manner by local fishermen throughout the department of Loreto, but also on a large scale by “moteros”, who come from other regions and receive support by some locals. However, more research is recommended in Pucallpa, Yurimaguas and Tarapoto to know the final destination of the mota loads. For the Requena area (Tapiche River) it was estimated that at least 100 dolphins were killed per year for piracatinga fishing (Gilleman & Zumba-Arimuya, 2018).

In 2020, WWF Peru conducted surveys in six communities of the Ucayali Basin/Canal de Puinahua (Brittany, San Carlos, Victoria, Juancito, Alfa and Omega), finding in these locations that very few people fish mota as a main activity. However, the existence of a well-organized fishing fleet based in the city of Pucallpa known as “moteros” was evidenced. The surveys also revealed that the bait used by mota fishermen consisted of cattle/pork blood and guts, large fish like pez torre (*Phractocephalus hemiliopterus*) and cahuara (*Pterodorus granulosus*) and, to a lesser extent, meat from wild animals such as river dolphins, black caiman, manatee, candiru (*Vandellia* sp.) capybara (*Hydrochoerus hydrochaeris*), and sometimes domestic animals. It is important to note that in Victoria, black caiman and river dolphins were used until 2016, when a post was installed to control the use of wildlife as bait. Fishermen in the communities of Alfa and Omega, and in the city of Pucallpa are known to have an intense mota fishery, relying on wildlife bait when cattle/pork bait is insufficient.

The Peruvian researchers suggest supporting the regional authority in charge of the fisheries (DIREPRO) to improve control and surveillance in the region’s ports and markets since, with the exception of the city of Iquitos, controls are few or non-existent due to lack of personnel. The most strategic regions are Caballo Cocha and Requena. It is recommended that surveys be maintained in the dry and wet seasons, because hydrological and meteorological conditions could determine the availability of piracatinga. Likewise, it is recommended that awareness campaigns be carried out with the riverine populations and to coordinate inspection operations of motor vessels and cargoes during the summer (July-October) by accredited inspectors, with



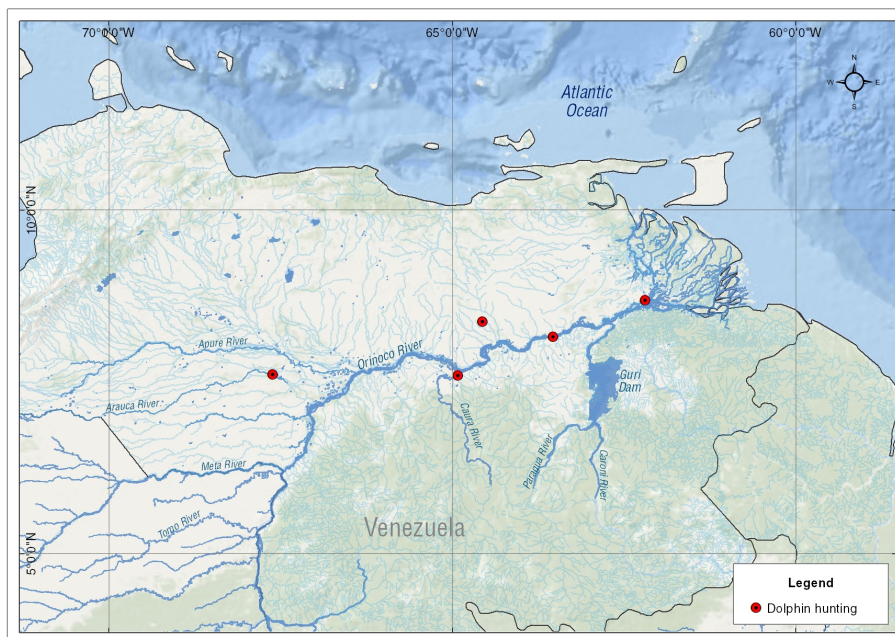
sanctions in case of the use of river dolphin meat. Similar to Colombia, it is also recommended to carry out studies on mercury content in piracatinga fish, to discourage the use of dolphin meat and thus reduce the fishing pressure and the associated use of river dolphins and other wildlife as bait. In Peru, there is strong evidence of mercury contamination in the southern Amazon in Madre de Dios region areas, where the illegal gold mining activity is increasing, and so there is a latent health risk linked to the consumption of fish that bioaccumulate mercury (Gilleman & Zumba-Arimuya, 2018).

## Ecuador

In Ecuador, mota is one of the ten most important fish species for both subsistence and commercial fishing in the region of the Napo River (Utreras, 2010; Utreras *et al.*, 2012). To date, there is no evidence that the remains of river dolphins are being used as bait in mota fishing; fishers commonly use beach crickets, bush animals or earthworms (Utreras, 2010). In the border area between Ecuador, Colombia and Peru, which corresponds to the Putumayo River, there are reports of catching mota, but the type of bait used is unknown.

## Venezuela

In 2018, a group of researchers conducted assessments along the Orinoco River in Venezuela to evaluate whether the situation described by Diniz (2011) of using dolphins as bait for piracatinga fishing still existed. They found that in five areas they still use dolphins for this purpose, and that this is done on behalf of buyers of piracatinga at certain times of the year. As bait, they traditionally use pork fat and meat, but occasionally river dolphins and spectacled caimans (*Caiman crocodylus*) (Briceño *et al.*, 2018).

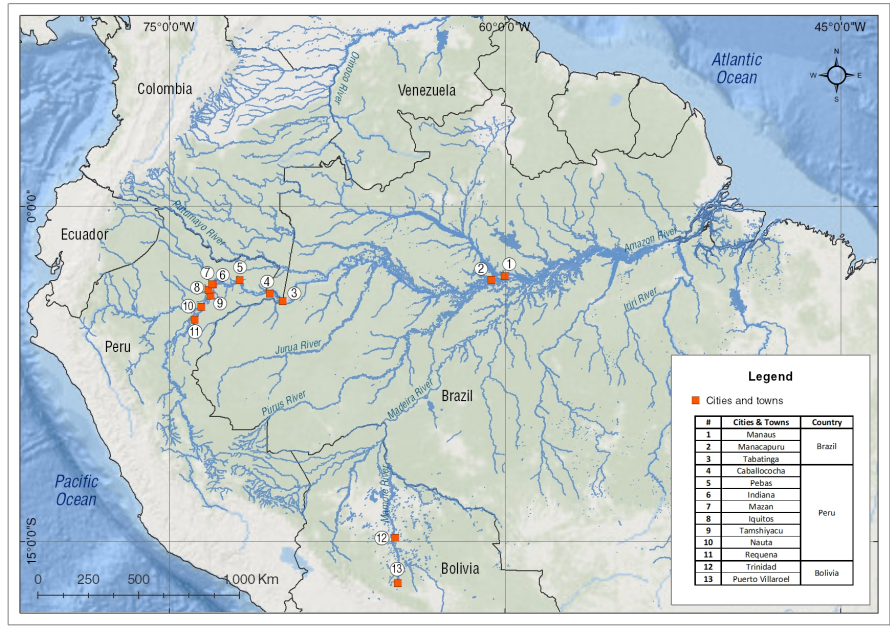




Locations in the Orinoco River basin in Venezuela where piracatinga are reportedly captured with dolphin carcasses.

Country	Legal measures	Type of action proposed	Evidence of dolphin killing for bait
Brazil	Instrução Normativa Interministerial n° 6, of July 17th, 2014	5-year ban 2015-2019	Yes
Colombia	Resolución 01710 del 23 agosto de 2017	Permanent ban on the piracatinga trade	Yes
Peru	NA	NA	Yes
Bolivia	NA	<i>De facto</i> prohibition of marketing in Cochabamba town	Yes
Ecuador	NA	NA	No
Venezuela	NA	NA	Yes

Table 1. Summary of legal measures to control piracatinga fishery or commercialization. NA = no legal measures promulgated.



Main fishing areas where piracatinga capture is reported in the Amazon and Orinoco basins

## **Final considerations and recommendations**

The discontinuation of the moratorium on piracatinga fishing in Brazil may have regional consequences, stimulating internal consumption as well as its commercialization in Colombian markets. However, the monitoring and surveillance of an area as large as the Amazon and the Orinoco is very complex, with border areas with very limited controls of fish transported. It is fundamental that, in addition to policies in each country, regional measures are put in place, with governments implementing joint actions.

The capture of piracatinga using dolphins is a transboundary problem based on economic dynamics of fisheries at the regional level. Undoubtedly, dolphins and other species such as caimans are affected in a collateral way due to poor fisheries management in the Amazon and Orinoco regions. It is important to evaluate the problem of piracatinga fishing not only from the perspective of dolphin conservation, but also taking into account the socio-economic aspects of fishing activity. Both the Amazon and Orinoco basins have a very large fishing potential, but the lack of management policies, added to the absence of fishing monitoring and unclear fishing and transport regulations between countries has led to the collapse of important fish stocks, and their replacement by other species such as the piracatinga. The capture and demand of a fish such as piracatinga is due to the overexploitation of the larger species, such as the larger catfish, should be considered as a warning message and is an opportunity to promote fisheries management plans in each country and at the regional level. In this sense, it is recommended that the governments of the region coordinate fisheries management measures in these basins, and promote monitoring systems. The Amazon Cooperation Treaty Organization (ACTO) may be the appropriate body to work on the fisheries issue, whereas the (currently undergoing nomination process) Conservation Management Plan for River Dolphins to be implemented through the International Whaling Commission (IWC), might provide an official regional framework at government level to face the problem of piracatinga fishing and associated dolphin use.

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