

TECHNICAL PAPERS SERIES

Ornamental Stingrays: Field trip aims to gather data for a population study of the species *Potamotrygon wallacei* (Chondrichthyes – Potamotrygonidae)

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ABSTRACT: The need to conduct a field study on the population and demographic dynamics of endemic species of freshwater ray in the Amazon Basin, used as ornamental fish, was identified and demanded by IBAMA under Component 3 of the Bioamazon Project. This is the case of the species *Potamotrygon wallacei*, also known as the Cururu ray, endemic to the mid Negro River. This paper is the report of the field trip conducted in November 2020, to the municipality of Barcelos, Amazonas State, to the main capture area of the species *P. wallacei* with the aim of collecting data to support population studies of the species in its main capture area in the Mid Negro River.

KEY-WORDS: *Potamotrygon wallacei*; raia cururu; Igarapé Daraquá System - Itu River - Bafuana; municipality of Barcelos; State of Amazonas; Brazil.

Background

The Regional Project for the Management, Monitoring and Control of Wildlife Species Threatened by Trade (Bioamazon Project), which is financially supported by German cooperation through the German Development Bank (KfW), aims to contribute to the conservation of Amazonian Biodiversity and especially of the species listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), increasing the efficiency and effectiveness of the management, monitoring and control of wild species threatened by trade in the Member Countries of the Amazon Cooperation Treaty Organization (ACTO).

Among the threatened species are the freshwater rays of the *Potamotrygonidae* Family GARMAN, 1877, subfamily *Potamotrygoninae* (CARVALHO et al. 2016), used as ornamental fish and listed in CITES.

The Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), CITES Administrative Authority, identified the need to study the population and demographic dynamics of endemic freshwater ray species of the Amazon Basin, used as ornamental fish, such as the species *Potamotrygon wallacei* (CARVALHO, ROSA & ARAÚJO, 2016), endemic to the Mid Negro River. This need was requested to the Bioamazon Project, under



Component 3, which aims to support initiatives for sustainable management and traceability of endangered species.

The current Brazilian legislation that regulates the export quota of rays for the ornamental market (IN No 204/2008 (MMA/IBAMA, 2008) is based on population studies conducted in the period 2003-2006. According to ARAÚJO & LESSA (2015), the export quotas of *P. wallacei* should be reviewed every two years, due to the particularities of its reproductive cycle (ARAÚJO, 1998).

In 2020, a total of five companies requested the quota of 4,498 cururu rays (MAPA/SAP, 2020), which represents 75% of the species' quota allowed for export. Data available from the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 2020), show that for the year 2018, 48% of *P. wallacei* exported from the state of Amazonas were individuals in the age class between 0 and 1 year (ARAÚJO, 2020).

In the scenario of the current legislation, which is the reality of the species in the mid Negro River, there is a population

growth of 5.6% in the generational period of 3.9 years (ARAÚJO, 2020; ARAÚJO & LESSA, in preparation).

To carry out the study required by IBAMA, it is necessary to collect updated data. Thus, this paper reports the field trip conducted in November 2020, to the city of Barcelos, Amazonas State, to the main capture area of the species *P. wallacei* (Cururu ray), to collect data to support population studies of the species in its main capture area in the Mid Negro River.

The Negro River Basin has an area of 715,000 km², and is characterized by acidic water - pH between 3 and 6 with an average of 4.5 - and poor in nutrients. In the mid Negro River is the Mariuá archipelago - more than 1,000 islands with different habitats, among them sandy beaches and igapó, also called flooded forest (LATRUBESSE & STEVAUX, 2015) (Figure 1).

The igapó areas are characterized by shallow water, poor in oxygen, with an average temperature around 25°C and a leafy bottom (ARAÚJO, 1998; DUNCAN & FERNANDES, 2010).

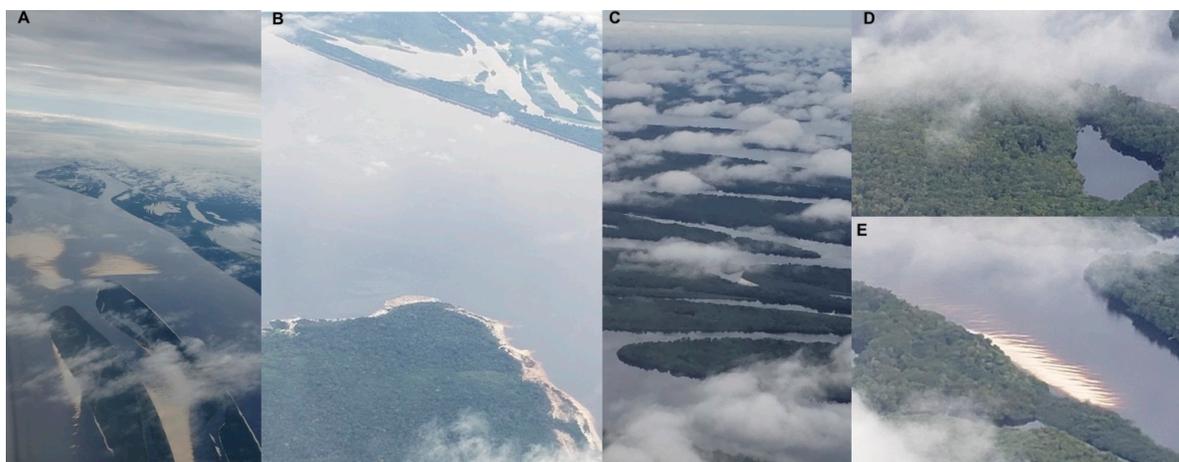


Figure 1: Aerial view of the Mid Negro River. Where A: Main channel of Negro River with island system of the Anavilhanas Archipelago. B: Negro River channel above the Anavilhanas Archipelago. C: Islands of the Mariuá Archipelago. D: Detail of an island with lake inside, and flooded forest. E: Island with sandy beach margin, and flooded forest area. Photo: ARAÚJO, M.L.G / ACTO.



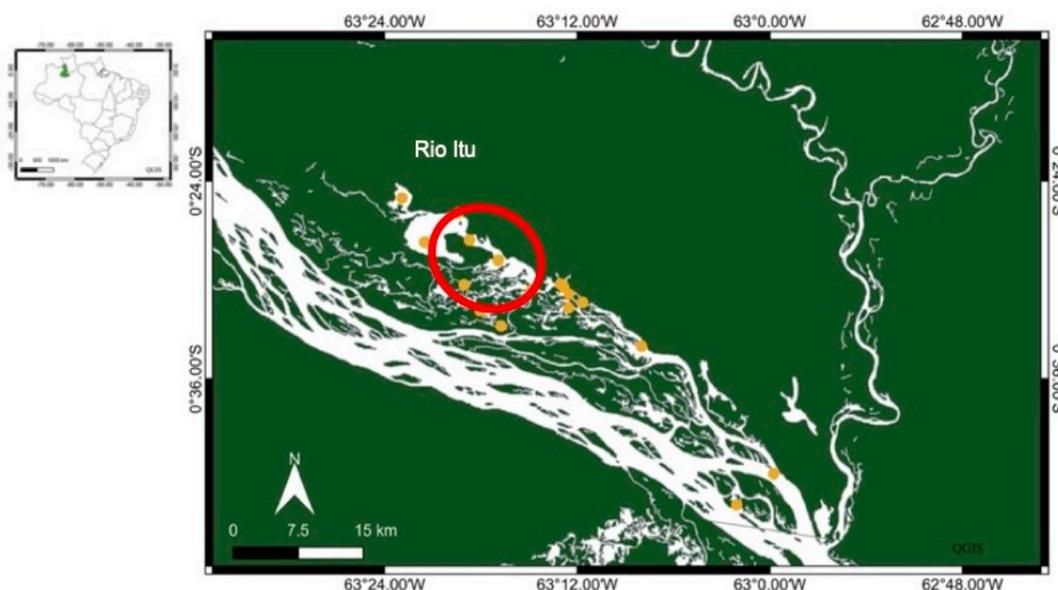
Figure 2: *Potamotrygon wallacei* in the igapó of Trovão Lake, Itu River. Photo: [ARAÚJO, M.L.G.].

Potamotrygon wallacei is a small ray, with disk width less than 350 mm. The species is endemic to the mid Negro River, and has in

the igapó (flooded forest) areas its preferred habitat (ARAÚJO, 1998; OLIVEIRA et al, 2016; DUNCAN et al, 2016) (Figure 2).

The areas visited were the main catch areas of *P. wallacei* in the Mid Negro River, located 70 km from the city of Barcelos, and include the streams of the Igarapé Daraquá - Itu River -

Bafuana system. This system contains traditional catch areas of *P. wallacei* for the ornamental fish market (Figure 3).



*Figure 3: Areas of capture of *P. wallacei* visited in the Igarapé Daraquá - Itu - Bafuana River System, in November/2020. The orange-colored points indicate the visited fishing grounds. The area demarcated in red indicates igapó area burned between 2015 -2016. Source: QGIS,3.28, Las Palmas.*

The boat trip from the Barcelos city port to the Trovão Lake took about forty-eight hours with the first stop in the Daraquá community. The trip between the city center and the community of Daraquá took seven hours. This trip was made on the branches of the channel in the main channel. The islands of the Mariuá Archipelago have a more clayey soil, similar to floodplain soils,

than the sandy soils typical of igapó. Despite the sandy soil, there is a thin superficial layer of soil that is rich in nutrients, and is very important for the plant species of the region (OLIVEIRA et al., 2001) (Figure 4 A).

The Mariuá archipelago has igapós with an average height canopy of 15 to 20 meters, and on the edge of the islands, the understory is relatively dense.

And in certain places there is abundant presence of palm trees (Figure 4 A-C) (JUNQUEIRA et al., 2017).

After the stop in the community of Daraquá, the expedition headed towards the Itu River with the objective of reaching the headwaters, that is, Lake Trovão, and along the way mapping the ornamental fishermen's camps that exist in the area. The Itu River has five tributaries, the Mulufu, Pente, Aduiá, Quani-Quani, and Cazurucu streams, as well as Lake Trovão. These igarapés, along with the Daraquá igarapé, composed a system of fishing areas controlled by one or two family fishing groups (ARAÚJO, 1998). In the period between September 2015 and March 2016, fires were burned in the igapó area between the Aduiá and Cazurucu igarapé (Figure 3).

In the lower igapó regions of the Igarapé Daraquá and Itu River (Figure 4 D-E), we observed the

presence of vegetation that has adaptations to survive longer periods of inundation, such as species of the *Apocynaceae* family, known in the region as molongó (JUNQUEIRA et al., 2017). In these areas with molongó there is greater abundance of the Cururu ray (ARAÚJO, 1998).

In the Itu River, the presence of islands in the main channel develops corridors of igapós, interspersed with areas of campina (Figure 4 F-H). In the campina areas, and where the flooding cycle is shorter, the areas are used as fishing camps (FIGURE 4H-I). In sandy beach areas, shrub vegetation may occur. The vegetation of igapós and campina show similarities with respect to being on sandy soils, which are subject to periods of drought and flooding (OLIVEIRA, et al. 2001).



Figure 4: Soil and vegetation characteristics of the islands of the Mariuá Archipelago in the stretch between Barcelos city seat and Igarapé Daraquá. A - Soil characteristics at the islands of the Mariuá Archipelago, with vegetation B - Branches of the main channel of the Negro River. C - Vegetation with predominance of palm trees. D - Igarapé Daraquá. E- Molongó at Itu River. F- Floodplain corridors formed by islands in the channel of Itu River, where we can observe alligators (Caiman crocodiles). G - Vegetation at the Igarapé Cazurucu area, H - Campina area at Trovão Lake. I - Campina area in the Trovão Lake. Photos: ARAUJO, M.L.G / ACTO.

Changes in the socio-economics of Barcelos Municipality

According to Prang (2001), after the 1950s, the main source of employment in the city of Barcelos in the 20th century was ornamental fish, and from 2001 on, other activities such as commercial fishing and sport fishing began to use the surplus

and available labor from ornamental fishing (INOMATA & FREITAS, 2015).

The reasons for the changes in the socio-economic dynamics in the municipality of Barcelos are due to logistical problems in the

exportation of fish (e.g. reduction in the number of flights leaving Manaus, Amazonas, after the closing of the VARIG airline), the reduction in the value of the dollar in 2003 (PRANG, 2007), and the closing of the largest export company in the state of Amazonas in 2008, which used to buy 60% of the ornamental fish from Negro River.

Currently, Barcelos is more known for sport fishing than for

mental fishing, a fact corroborated by the presence of different types of boats present in the port, as illustrated in Figure 5. Of the 250 registered fishermen practicing ornamental fishing in Barcelos (PRANG, 2001) in the late 1990s, less than 50% remain active (LADISLAU, et al.,2020). In conversations with fishermen during the trip, they estimated that about 40 people currently fish for ornamental fish in Barcelos.



Figure 5: Changes in the Barcelos economy. Where: A - Porto de Barcelos, dominated by piabeiros boats (1990) (Photo: Chao, N.L.). B - Port of Barcelos, with a greater presence of sport fishing boats (hotel boat, and support boat) (2006). C - Port of Barcelos, with the presence of sport fishing boats (hotel boat and support boat), commercial fishing boat, and absence of piabeiros boats (2020). Photos B and C: ARAÚJO, M.L.G / OTCA.

In addition to sport fishing, the number of commercial fishers (edible fish fishermen) has increased since 2001 by the migration of piabeiros (ornamental fish fishermen) to commercial fishing (PRANG, 2007). This change intensified in 2003, which caused several conflicts between commercial fishermen and sport fishing companies over peacock-bass species (*Cichla* spp.), particularly the tucunaré-açu

Cichla temensis (HUMBOLDT 1821) (FREITAS & RIVAS, 2006). Currently, the State Decree no. 31.151 of 2011 prohibits the capture of peacock-bass species in the Negro River Basin.

Records of socioeconomic changes in the municipality of Barcelos were observed in the Igarapé Daraquá - Itu River - Bafuana system. Traditionally, this system was an ornamental

fishing area for about 36 fishermen, distributed in about 10 fishing points (ARAÚJO, 1998; PRANG, 2001). Currently in this area (see Figure 3), only two ornamental fishing camps are active (Igarapé Daraquá and Igarapé Aduiá). A total of four camps observed on the Itu River were of commercial fishermen,

and the main fishing gear was the fishing net.

At the entrance of the Igarapé Aduiá there is a sign telling people not to enter without permission (Figure 6). The reason for the sign is to prevent, mainly, commercial fishermen from entering.



Figure 6: Igarapé Aduiá, fishing area active in the capture of ornamental fish. Where: A - Fishing camp of the Borges family, a family group of fishers from the Igarapé Aduiá. B - Warning sign indicating the need for permission to enter the Igarapé Aduiá. Photo: ARAÚJO, M.L.G / ACTO.

Between Igarapé Aduiá and Lago Trovão fires occurred between September 2015 and March 2016

in the flooded forest (igapó) area

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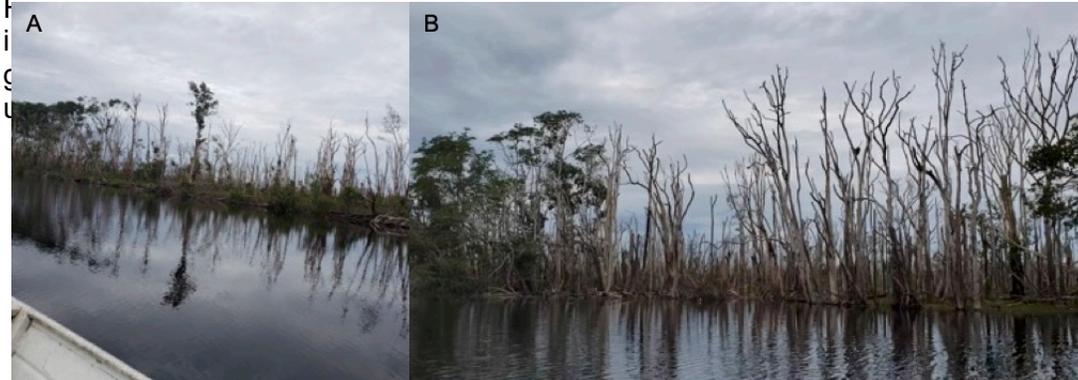


Figure 7. Igapó area between Igarapé Aduiá and Trovão Lake on the Itu River burned between September 2015 to March 2016 (see video: <https://youtu.be/pLykgfibvBc>) Photo: ARAÚJO, M.L.G. / ACTO.

According to OLIVEIRA et al. (2001), the igapó vegetation is susceptible to fire and is not adapted to recurrent burnings like the cerrado vegetation. The natural regeneration process of these forests is very slow due to the environmental conditions. For the ray *Potamotrygon wallacei*, situations such as fires in igapó areas can cause drastic population reductions, because the species presents high environmental specificity to its preferred habitat, which is the igapó (ARAÚJO, 1998; CARVALHO et al, 2016).

The decline of ornamental fish and growth of sport fishing can be observed in the absence of

ornamental fish net-tanks in the Daraquá community, and also by the installation of a lodge in the same community for tourists that go sport fishing in the Igarapé Daraquá - Itu River - Bafuana System. The Daraquá community is formed by a single family group, which had its economic base in ornamental and commercial fish fishing. The lodge is the result of a partnership between a family from the community and businessmen from São Paulo. Although there is the use of part of the local labor force, it is reduced. Likewise, the economic benefits generated by the activity do not reach all residents of the community in the same way (Figure 8).



Figure 8: Changing economic activity in the community of Daraquá. Where: A and B - Net-tanks for ornamental fish in the Daraquá community. A - 2004. B - 2020. C - Guesthouse in Daraquá community. D - Sport fishermen at the entrance of the Itu River. Photos: ARAÚJO, M.L.G. / ACTO.

During the field trip, all procedures recommended by the World Health Organization (WHO) were adopted. The number of people on the team was reduced, and the lead researcher was tested for COVID-19 prior to the trip to Barcelos. All of the local team members had previously had COVID-19. One of the

members was a nursing technician.

In all the areas visited there were cases of COVID-19. Agents from the Health Surveillance and Environment Secretariat of Barcelos, while working in the Itu River area, visited the expedition's camp, and approved

the procedures adopted by the team regarding health and environmental standards,

Conclusion and recommendations

In the Igarapé Daraquá - Itu River - Bafuana system a reduction in the number of ornamental fishermen's camps was observed. The situation observed at the Igarapé Aduiá, with a ban on the entry of people outside the family fishing group, gives evidence of protection of the fishing territories. A similar attitude was reported in Igarapé Cazurucu, but could not be verified.

The area impacted by the fires represents about 25% of the

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igarapó in the Itu River region. This means significant alteration/loss of the preferred habitat of the species *Potamotrygon wallacei*, and may cause population reduction or impact the fishing of the species for the ornamental market. This scenario should be considered when assessing the population status of the species.

The worsening of the pandemic of COVID-19 prevented the second field trip from taking place in January 2021. However, the data collected on this preliminary trip will allow answering questions related to changes in fishing effort, mapping of fishing territories, and estimates of population parameters, which correspond to the next steps of the project.

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Published in the Bioamazon Newsletter, issue n. 8, March-April 2021.

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