

Amazon Fisheries

Mapping management and
monitoring initiatives



Supported by:



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@ Fernanda Silva – Amazon floodplain – Manacapuru/AM – Brazil

Project Overview

The goal of this project was to map and characterize freshwater fisheries management and monitoring initiatives in Amazon. Understanding the location and characteristics of management and monitoring initiatives is critical for informing management decisions, identifying gaps in conservation or protection and strengthening conservation. It also allows for identifying opportunities for increasing or maintaining aquatic connectivity, which is key for healthy and resilient freshwater ecosystems and habitats.

These maps are intended to be shared among various actors and agencies to promote collaboration and equitable knowledge exchange. Environmental agencies can leverage this information to systematize conservation initiatives and effectively manage actions and metrics. The goal is to expand impact through collaborative policies and partnerships since the spatial distribution of initiatives can inform decisions strategically.

Maps generated from the collected data distinguish between two types of initiatives:

- Fisheries management initiatives are shown in red.
- Fisheries monitoring initiatives are represented by blue dots.

HIGHLIGHTS

Fisheries Management Initiatives



155 across 4 Amazon countries, covering about 13 million hectares



34% overlap with protected areas



1,214 communities and 21,624 fishers involved



59 focused on the single specie Arapaima

Fisheries Monitoring Initiatives



60 across 5 Amazon countries



86% are involved in citizen science



20 of 155 management initiatives conduct systematic monitoring

It should be emphasized that these maps represent an initial version of an evolving resource. In particular, informal or non-recognized efforts remain difficult to document due to limited available knowledge, and several areas may be underrepresented or inaccurately mapped as a result of incomplete geographic data or the absence of official or community-sourced information.

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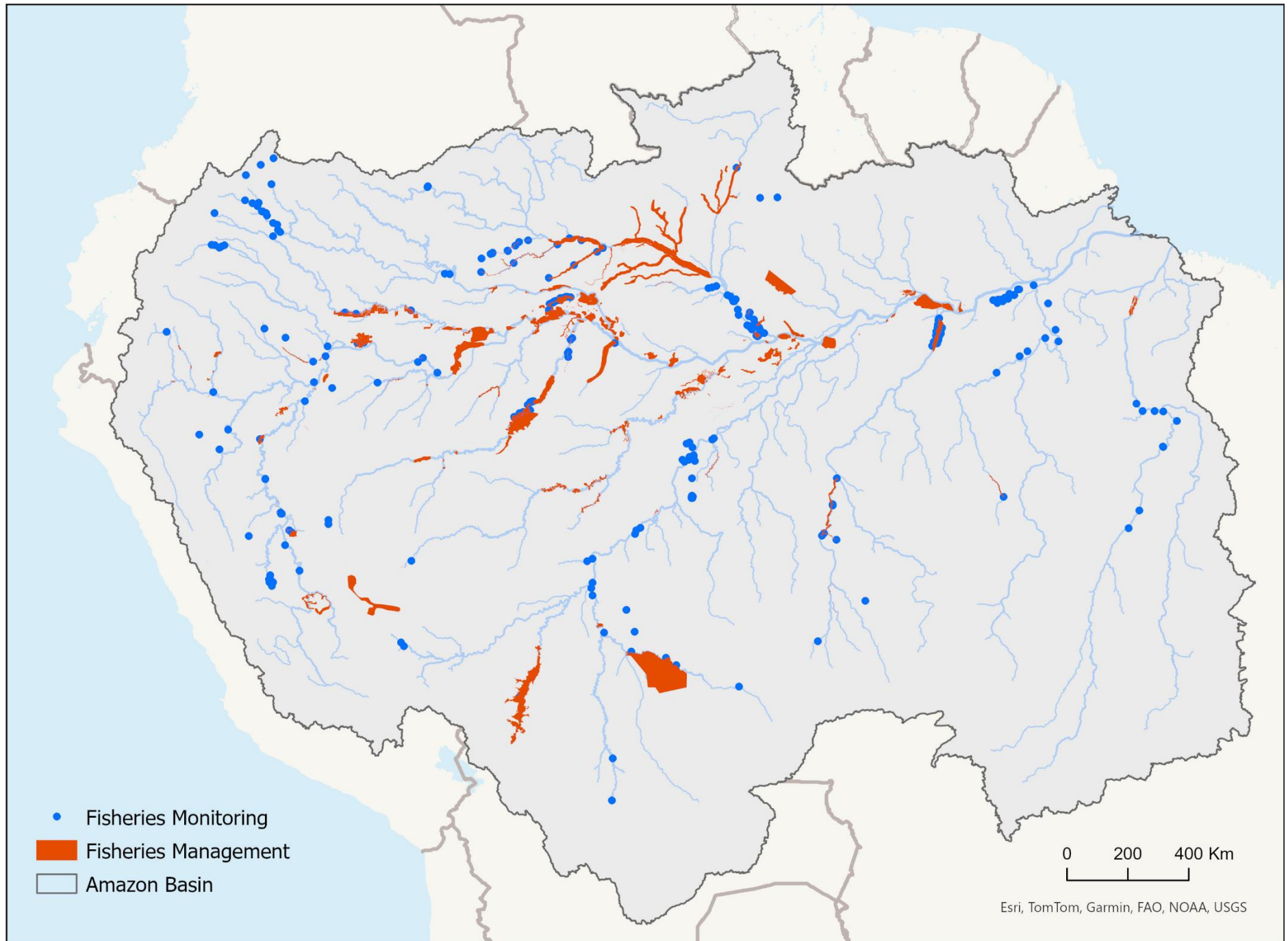


Figure 1: Map illustrating 155 fisheries management initiatives across the Amazon, covering nearly 13 million hectares, along with 60 identified fisheries monitoring initiatives.

Fisheries Management Initiatives in relation to other land use designations

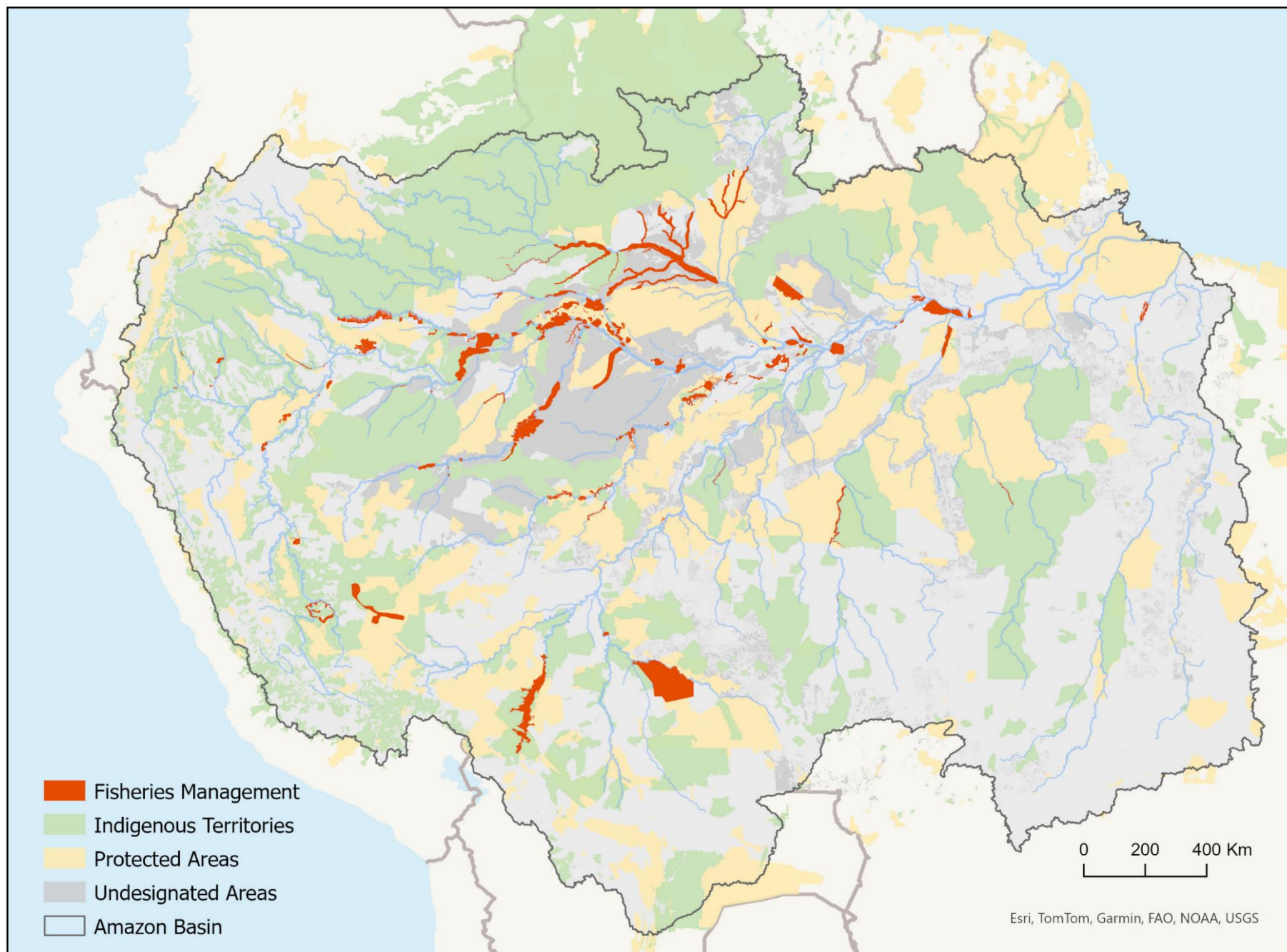


Figure 2: The 155 fisheries management initiatives identified in the Amazon exist within a landscape of terrestrial management designations. Linking management of aquatic and terrestrial environments and resources reflects the important interactions and dependencies between the Amazon River and the rainforest.

Collecting information and compiling data on freshwater fisheries management and monitoring in the Amazon is an immense challenge due to the vastness of the territory and the dispersion of initiatives, so various methodologies were employed to . A survey was conducted among different actors and institutions (e.g., governmental, non-governmental, research) involved in fisheries. Additionally, a snowball methodology was utilized to increase the number of responses and conduct interviews with strategic actors, such as environmental analysts from the government.

It is important to note that many of the mapped areas lack high spatial accuracy, as they were not sourced from official institutions or curated by local communities. This map should be viewed as a starting point for understanding the spatial distribution of fisheries initiatives and for developing strategies to engage with and strengthen these efforts.

Methods and data collected

To improve our understanding of ongoing Fisheries Management Initiatives in the Amazon, the following information was gathered whenever possible:

-  Area characteristics (River Basin, Protected Area - if applied, Federal unit, Municipality, Country)
-  Number of fishers involved in management activities Number of communities
-  Number and names of fish species being managed
-  Any spatial information about the managed area (shapefile, map, table with geographical coordinates, reports, etc)

Results - Fishery Management Initiatives

A total of 155 Fisheries Management Initiatives (Figure 1) were identified in this project across four countries in the Amazon region (Figure 3). Most of these areas are in Brazil (75%) and Peru (22%). In Brazil, the state of Amazonas has the highest number (98), followed by the state of Pará (13). In Peru, the Department of Loreto leads with 21, followed by Ucayali, with 13 Fisheries Management Initiatives.

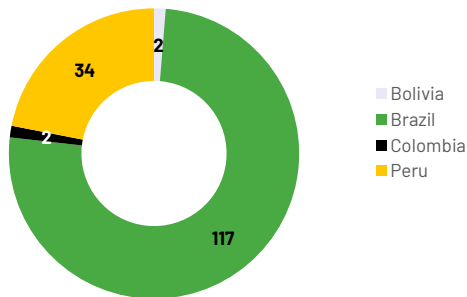


Figure 3: Number of fisheries management initiatives surveyed by country

The degree of formal recognition granted to Fisheries Management Initiatives by official institutions varies across the Amazon region, being structured through a range of tools, including Fishing Agreements, Fisheries Management Plans, Lake Management Plans, and other community-based programs. These instruments follow similar methodological frameworks and may be formally recognized through legal acts published in official government bulletins. Fishing Agreements, for example, are typically formalized through Normative Instructions, while other tools are often implemented within Conservation Units, Indigenous Territories, and approved by management councils through official resolutions.

Despite these mechanisms, many Fisheries Management Initiatives are still governed by local actors without formal recognition, which poses challenges for documentation and visibility. These non-formalized initiatives are likely underreported and underrepresented in this effort, even though they play a critical role in sustaining fisheries, supporting local governance, and maintaining ecological connectivity.

Approximately 34% of Fisheries Management Initiatives (by area) are located within or have substantial portions overlapping with various protected land categories (Figure 2). These include Sustainable Development Reserves, Extractive Reserves, National Parks, Environmental Protection Areas, and Regional or Community Conservation Areas, among others. Additionally, 26% of those are in Indigenous Territories (Figure 4).

In the Brazilian Amazon, Undesignated Public Forests refer to lands owned by state or federal governments that have yet to be formally classified under a specific land use category (Law No. 11.284/2006). Due to their undefined legal status, these areas are especially vulnerable to land grabbing, illegal deforestation, and other forms of environmental degradation.

Approximately 17.5% of Fisheries Management Initiatives (by area) are located within, adjacent to, or significantly influenced by undesignated public forests. Assigning formal protection status to these regions could enhance conservation outcomes, as evidence suggests that community-led fishery management within officially protected areas tends to yield more robust ecological benefits and long-term sustainability (Carvalho et al., 2024).

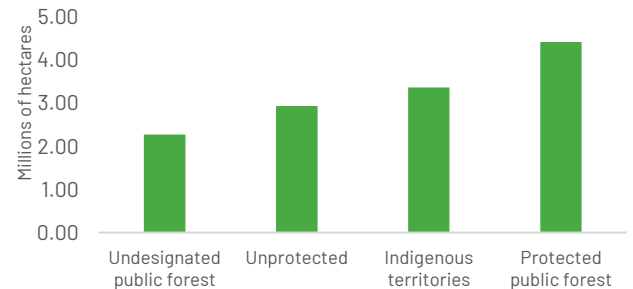


Figure 4: Size (in hectares) of fisheries management areas in undesignated areas, unprotected areas, indigenous lands and protected areas

In total, 1,214 communities (data from 85% of the Fisheries Management Initiatives) and 21,624 fishers (71% of the Fisheries Management Initiatives) are involved in fisheries management in the Amazon. Fifty-nine Fisheries Management Initiatives are dedicated to managing the single species Arapaima. Most of the Fisheries Management Initiatives focus on subsistence and commercial fishing, with 33 Fisheries Management Initiatives designated for sport fishing and 12 for ornamental fishing.



Fisheries Monitoring Initiatives in relation to other land use designations

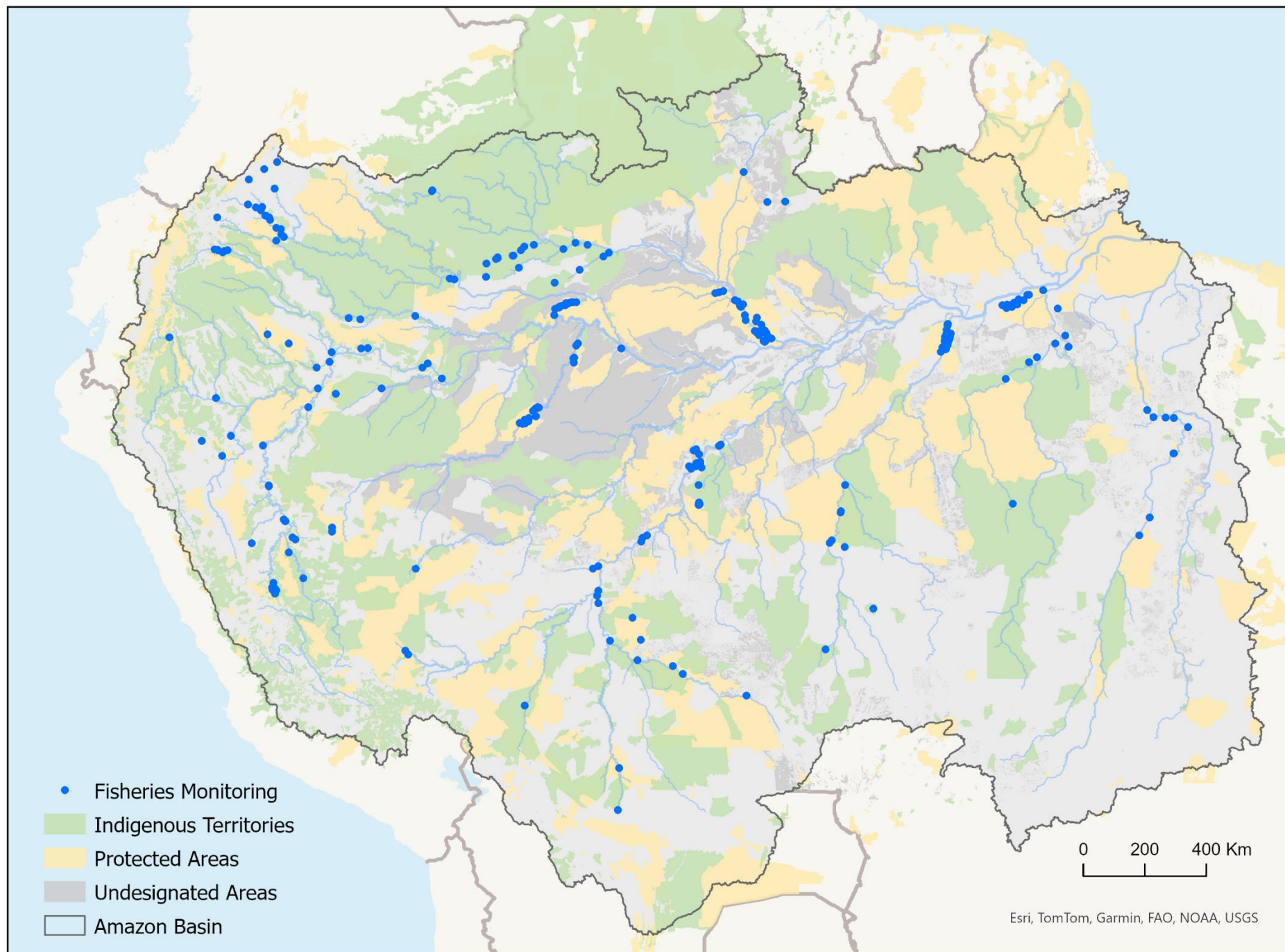


Figure 5: Fisheries monitoring sites of 60 fisheries monitoring initiatives identified in the Amazon

Methods and data collected

On the map produced, monitoring efforts are depicted as points rather than areas due to the difficulty in obtaining precise data on the number and location of sampling sites. Representing them as areas could lead to overestimation of monitoring coverage. For instance, a monitoring point at a market or landing site does not provide accurate geographic information about the actual monitored area. Therefore, only the location of the sampling site is shown.

Fisheries monitoring initiatives were compiled and analyzed with the goal of understanding basic information about the projects, including objectives, geographic information and main data being collected. Questions asked during the survey were:

-  **Area characteristics:** river basin, protected area (if applicable), Federal unity, Municipality, Country);
-  **Fishing modalities:** Subsistence, Commercial, Sporting, ornamental
-  **Monitoring Program Objective:** Compliance with management rules; Compliance with environmental requirements of projects; Track changes in fish stocks; Improvements in human well-being; Monitoring management activities; No clear objectives; Other
-  **Who collects the data:** Community member (citizen Science); Researcher; Government employee /hired; Other
-  **Methodology for data collection:** Fish counting; Interviews with fishers; Recording of fish caught in the community; Data collection at landing sites; Data collection at fish markets; Other
-  **Number of fish species monitored:** One species; The main ones of interest to fisheries; All those caught by fishing
-  **Fishery information registered by the monitoring project:** Species caught; Total biomass; Biomass by species; Number of fish (total); Number of fish (by species); Fish length; Number of fishers; Boat size; Travel time; Fishing gear; Environment fishing took place (river, lake); Fish marketed or consumed; Price, Fuel; Fish destination
-  **Frequency of sampling events:** every day; once a week to once a month; once a month; Quarterly; Every 6 months; Once a Year
-  **Fishery monitoring project time frame:** short term (a Year or less); medium term (one to five Years); long term (more than five Years)

 **Proportion of the total fishery represented by sampled data:** Less than 10%; Between 10 and 40%; Between 40 and 70%; More than 70%; I have no information to measure this value

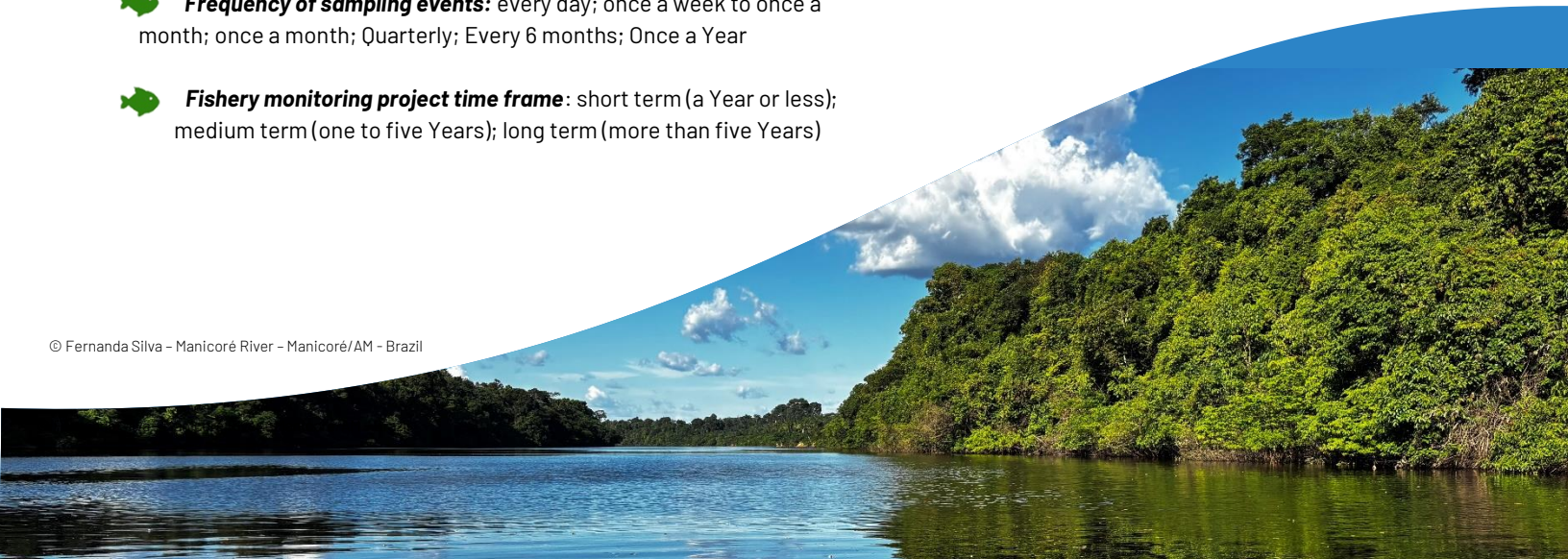
 **Socioeconomic data:** No socio-economic information collected; Age; Gender; Family size; Income; Income from fishing; Livelihoods; Human well-being; Social group/ethnicity; Gender; Religion

 **Strategies for interacting with local communities:** Training for sampling is carried out; Meetings to introduce the monitoring activities; Feedback meetings to present and discuss the monitoring data; Technical and visual materials are developed; There are no interaction activities with the communities

 **Main challenges:** Geographical scale/size of the area; Logistics; Society's engagement and/or trust; Limited financial resources; Training of data collectors; Other

 **Efficacy/perception of the monitoring project:** Effective at achieving the objective(s); NOT effective in achieving the objective(s); Monitoring data has never been analyzed; I don't have enough knowledge to answer.

 **Any geographical information about the monitored area:** shapefile, map, table with geographical coordinates, reports, etc.



Results

Sixty Fisheries Monitoring Initiatives (Figure 5) were surveyed across five countries in the Amazon region (Figure 6), with the majority being developed in Brazil (78%) and Peru (18%). The main objectives of the surveyed fisheries monitoring initiatives were to monitor variations in fish stocks and management plans, and evaluate improvements in human well-being (Figure 7).

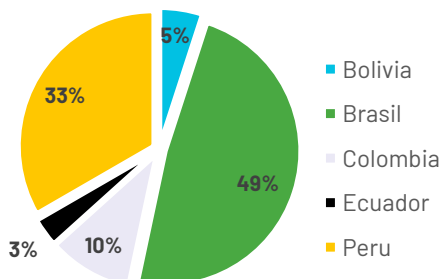


Figure 6: Number of fisheries monitoring initiatives surveyed by country

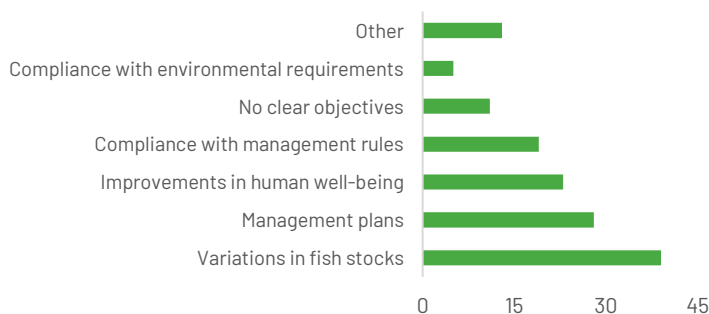


Figure 7: Main objectives of the fisheries monitoring initiatives surveyed

Regarding the frequency of sampling from respondents who answered this question, 45% of the fisheries monitoring initiatives involved daily data collection; 18% from once a week to once a month, 22% from once a month to four times a year, and 15% less than four times a year. Most fisheries monitoring initiatives involve citizen science, with 86% of those having data collected by members of local communities or fishers. Additionally, 20% involve researcher participation and 12% a government employee or contractor. Most of the fisheries monitoring initiatives (43%) are long-term, collecting fishery information for more than five years, while 22% are medium-term, and 22% are of indeterminate duration.

In Figure 8, we present the types of data and the percentage of fisheries monitoring initiatives for each type. The most collected information includes the species caught, catch location, and the biomass caught. Regarding socioeconomic data, 58% of the fisheries monitoring initiatives did not include socioeconomic information, while 33% collect information on age and/or gender. Only 21% of the fisheries monitoring collect economic information about the income from fisheries (Figure 8).jjj

FISHERIES MONITORING

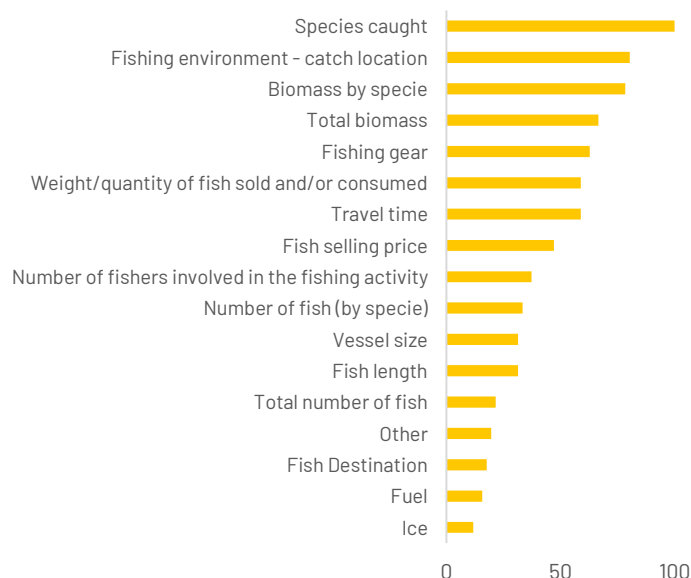
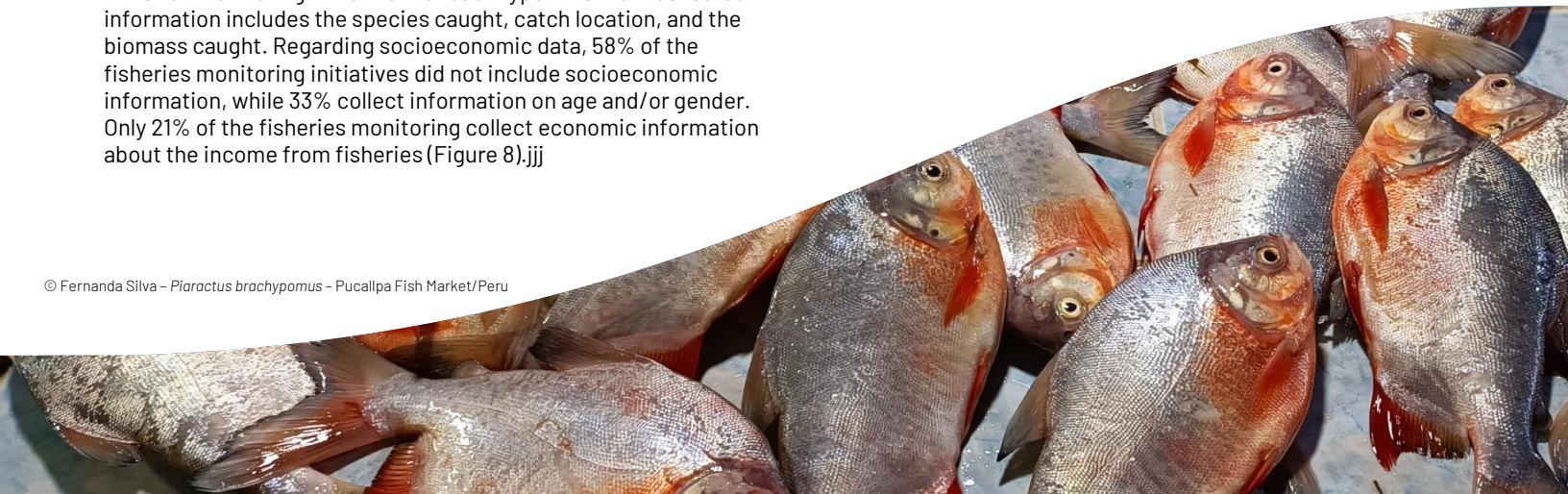


Figure 8: Type of data and percentage of fisheries monitoring initiatives collecting the data type.

Considering respondents' opinions about the efficacy of fisheries monitoring data in achieving their objectives, 35% believe that fisheries monitoring initiatives provide sufficient data for their objectives, 27% consider the monitoring inefficient for their objectives, and 10% have never analyzed data from their fisheries monitoring program/project.

When analyzing all management and monitoring areas collectively, we found that only 20 out of 155 Fisheries Management Initiatives reported conducting systematic fisheries monitoring. At least half of these areas manage *Arapaima* – a species that requires annual population counts to establish fishing quotas. Although this counting process is not typically classified as fisheries monitoring, it plays a crucial role in tracking changes in fish stocks. Given its importance, environmental regulatory agencies could consider a centralized program to manage and oversee the data generated from these counts.



Future perspectives

The goal of this project was to understand the number and locations of fisheries management and monitoring initiatives in the Amazon. The current map is not a final product; it is designed to be a living document where new fisheries initiatives can be added or updated as they are identified or reported. Since the map does not contain exhaustive information, there are several future actions to enhance its potential application by different actors.

Validation of ongoing activities and improvement of information: Many areas were compiled using official regulatory documents without certainty about which fisheries management activities are in place. Investigating each fishing management initiative will provide evidence about its status, as well as detailed information about management rules, governance, changes over the years, monitoring programs, etc.

Validation of spatial areas with strategic actors: Most of the boundaries for the fisheries management areas are inaccurate, as many did not originate from official institutions and were not validated by local communities and institutions. Some areas were created using lake boundaries provided in reports about *Arapaima* counts for fishing quotas, which can underestimate the size of the total management area. Also, there was overlap of some areas that need to be corrected, as well as geographic validation in the field.

Understand protection mechanisms: Some fisheries management areas are located within protected areas, while others are adjacent to them. Understanding the extent to which freshwater ecosystems are protected is crucial for evaluating the governance and conservation status of these areas. To achieve this understanding, every fisheries management area needs to be carefully evaluated.

Add informal Fisheries Management Initiatives: Means recognizing and incorporating the Fisheries Management Initiatives that have not yet been mapped, particularly those lacking official government recognition – informal Fisheries Management Initiatives. Most of the Fisheries Management Initiatives currently mapped are formalized, which makes them easier to track. However, a significant number of community-led fisheries management initiatives remain undocumented and require targeted investigation in collaboration with local organizations to ensure their contributions to sustainable fisheries are acknowledged and supported.

Promote basin-wide awareness and coordination: To ensure that fisheries stakeholders across the Amazon basin – including communities, users, and decision-makers – are informed about the various conservation efforts underway. This shared awareness can foster greater collaboration and alignment. Additionally, it is essential that governments and other actors engage in dialogue to develop and approve mechanisms that connect and coordinate these initiatives, enabling a more integrated and basin-wide approach to fisheries governance.

Additional spatial analyses: With this data set there is the potential to explore a series of spatial analyses. For example: (1) how do these fisheries management areas overlap with priority freshwater conservation areas identified in other programs? (2) how do these fisheries management areas contribute to freshwater conservation across the Amazon basin and what is their potential to FW conservation are spatially; (3) Where are there gaps in fisheries management areas and how can those gaps be filled?

