



Artisanal fishing for Tucunaré (*Cichla ocellaris*) in northeastern Pará: capture and subsistence strategies of traditional communities

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Resumo - Pesca artesanal de Tucunaré (*Cichla ocellaris*) no nordeste do Pará: estratégias de captura e subsistência de comunidades tradicionais

O estudo focou na pesca artesanal de Tucunaré (*Cichla ocellaris*) no nordeste do Pará, destacando sua importância socioeconômica e cultural para comunidades tradicionais. A pesquisa foi realizada nas aldeias de Remédios (1°05'13"S; 48°11'41"W) e São Raimundo de Borralhos (1°01'28"S; 48°14'32"W) em Santo Antônio do Tauá, envolvendo entrevistas com pescadores e observações de campo. Os resultados revelaram que linhas de mão/anzóis foram o principal método de captura (68,6%), seguido por anzóis de galho, tarrafas e redes de emalhar. As atividades de pesca foram realizadas principalmente sentado (37,1%) ou caminhando (34,3%), com preferência por lagos marginais (42,9%) e remansos (28,6%). A maior parte da pesca foi consumida domesticamente (72%), com parte vendida (18%) e trocada dentro da comunidade (10%). O estudo destaca o papel essencial da pesca artesanal do tucunaré na garantia da segurança alimentar, na geração de renda adicional e na preservação das tradições culturais, ressaltando a necessidade de políticas públicas de apoio e acordos comunitários para sustentar a prática.

Palavras-chave: Amazônia, comunidades ribeirinhas, pesca cultural.

Abstract - Artisanal fishing for Tucunaré (*Cichla ocellaris*) in northeastern Pará: capture and subsistence strategies of traditional communities

The study focused on artisanal fishing of Tucunaré (*Cichla ocellaris*) in northeastern Pará, highlighting its socioeconomic and cultural importance to traditional communities. The research was conducted in the villages of Remédios (1°05'13"S; 48°11'41"W) and São Raimundo de Borralhos (1°01'28"S; 48°14'32"W), located in the municipality of Santo Antônio do Tauá. Data collection involved interviews with fishermen and field observations. The findings revealed that handlines and hooks were the primary fishing method (68.6%), followed by circle hooks, cast nets, and gillnets. Fishing activities were mainly performed while sitting (37.1%) or walking (34.3%), with a preference for marginal lakes (42.9%) and backwaters (28.6%). Most of the catch was consumed domestically (72%), while a smaller portion was sold (18%) or exchanged within the community (10%). The study emphasizes the essential role of artisanal Tucunaré fishing in ensuring food security, generating supplementary income, and preserving cultural traditions. It also highlights the need for supportive public policies and community-based agreements to sustain this traditional practice.

Keywords: Amazon, riverside communities, cultural fishing.

Resumen - Pesca artesanal de tucunaré (*Cichla ocellaris*) en el nordeste de Pará: estrategias de captura y subsistencia de las comunidades tradicionales

El estudio se centró en la pesca artesanal de tucunaré (*Cichla ocellaris*) en el noreste de Pará, destacando su importancia socioeconómica y cultural para las comunidades tradicionales. La investigación se llevó a cabo

en las aldeas de Remédios (1°05'13"S; 48°11'41"O) y São Raimundo de Borralhos (1°01'28"S; 48°14'32"O) en Santo Antônio do Tauá, involucrando entrevistas con 35 pescadores y observaciones de campo. Los hallazgos revelaron que las líneas de mano/anzuelos fueron el principal método de captura (68,6%), seguido de los anzuelos circulares, las atarrayas y las redes de enmalle. Las actividades de pesca se realizaron principalmente sentados (37,1%) o caminando (34,3%), con preferencia por lagos marginales (42,9%) y remansos (28,6%). La mayor parte de la pesca se consumió en el país (72%), y una parte se vendió (18%) e intercambió dentro de la comunidad (10%). El estudio destaca el papel esencial de la pesca artesanal de tucunaré para garantizar la seguridad alimentaria, generar ingresos adicionales y preservar las tradiciones culturales, lo que subraya la necesidad de políticas públicas de apoyo y acuerdos comunitarios para sostener esta práctica.

Palabras clave: Amazonía, comunidades ribereñas, pesca cultural.

Introduction

Artisanal fishing in the Amazon is essential for the subsistence, income, and culture of traditional communities, with Tucunaré (*Cichla ocellaris*) being one of the most valued species both for its taste and commercial potential (Isaac et al., 2015; Silvano and Hallwass, 2020; Tregidgo et al., 2021). Tucunaré accounts for a significant portion of catches in different Amazonian basins, such as Xingu and Purus, and is targeted by commercial, subsistence, and sport fisheries (Isaac et al., 2015; Campos et al., 2019; Tregidgo et al., 2021). Participatory research with fishermen reveals that Tucunaré is highly valued locally and that its reproductive cycle, abundance, and size vary according to the time of year and the environment, which is fundamental information for sustainable management (Campos et al., 2019; Silvano and Hallwass, 2020).

Fishing for Tucunaré is also important in reservoirs such as Balbina, where, despite providing income, the financial return is low and subject to seasonality and market price variations (Inomata et al., 2020). The urban market, especially in cities such as Manaus, intensifies selectivity for species of higher commercial value, such as Tucunaré, which can contribute to overfishing of these species (Tregidgo et al., 2021). Management strategies, such as adjusting the age of first slaughter and catch-and-release practices, are considered essential to ensure the sustainability of stocks and maintain the socioeconomic role of artisanal fishing in the region (Thomé-Souza et al., 2014; Campos et al., 2019).

Fishing for Tucunaré in Brazil is still characterized by traditional, low-cost methods, such as the use of hand lines, small boats, and simple equipment, which are accessible to most local fishermen. These methods are predominant in both commercial and subsistence fishing, especially in communities with low levels of education and limited financial resources, where income from fishing is variable and often insufficient, making the activity an important source of supplementary income (Isaac et al., 2015; Inomata et al., 2020). Fishermen's ecological knowledge of Tucunaré, including its habits and environmental impacts, is significant and can be leveraged for sustainable management strategies, especially when combined with participatory monitoring and research methods (Silvano and Hallwass, 2020; Catelani et al., 2021).

The social context of Tucunaré fishing involves fishermen's associations, community practices, and a cultural appreciation of the fish, both for consumption and for the local economy (Silvano and Hallwass, 2020; Inomata et al., 2020). The active participation of fishermen in research and monitoring of Tucunaré populations contributes to the generation of relevant data on abundance, seasonality, and breeding sites, strengthening participatory and sustainable management (Silvano and Hallwass, 2020). Therefore, understanding the traditional methods and social context of Tucunaré fishing is essential for proposing management strategies that respect the local reality and promote the sustainability of fishery resources (Silvano and Hallwass, 2020; Inomata et al., 2020; Catelani et al., 2021).

Traditional methods of catching Tucunaré in northern and northeastern Brazil mainly involve the use of small boats, such as motorized canoes, and simple equipment, such as hand lines, hooks, and nets, with hand lines being one of the most commonly used tools by commercial and subsistence fishermen (Isaac et al., 2015; Inomata et al., 2020). Fishing for Tucunaré is an important activity for the subsistence of traditional communities, as it represents an important source of protein and income, although the revenue obtained is generally low and variable, depending on seasonal factors and market prices (Inomata et al., 2020).

Besides providing nutrition, fishing for Tucunaré can also help these families earn extra income. However, due to the unpredictable nature of fishing earnings, they often need to explore alternative sources of livelihood (Silvano and Hallwass, 2020; Inomata et al., 2020). The local ecological knowledge of fishermen about Tucunaré and other species is fundamental for the sustainable management of fishery resources and can contribute to conservation and regulation strategies (Catelani et al., 2021). Artisanal fishing for Tucunaré plays a central role in the economy and food security of traditional communities, in addition to strengthening cultural

ties and traditional knowledge about the aquatic environment (Inomata et al., 2020; Reis et al., 2022). Thus, the objective of this study was to describe the artisanal methods used to catch Tucunaré (*Cichla ocellaris*) in northeastern Pará and discuss their relevance to the subsistence of traditional communities.

Materials and Methods

The research was conducted between January and June 2025 in the village of Remédios (1°05'13" S; 48°11'41" W) and the village of São Raimundo de Borralhos (1°01'28" S; 48°14'32" W), belonging to the municipality of Santo Antônio do Tauá, in northeastern Pará. Semi-structured interviews adapted from Ruslin et al. (2022) were conducted with 35 fishermen and farmer-fishermen, in addition to direct observations during fishing trips.

The variables examined consisted of fishing methods (line, branch hook, cast net, gillnet), fishing modalities (sedentary, drifting, waiting), environments utilized (backwaters, streams, marginal lakes, branches), and fish destination (domestic consumption, sale, exchange). This method was adapted from Batista et al. (2020), Marques et al. (2025) and Souza et al. (2025).

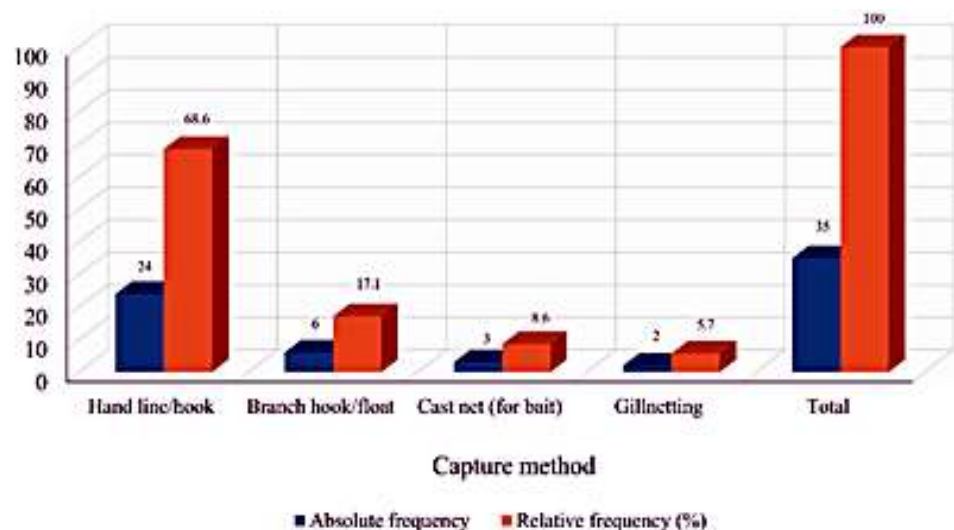
Participants signed an informed consent form (ICF), guaranteeing the confidentiality of the information. All interviews and records were authorized in advance, respecting ethical research standards in accordance with Marques et al. (2025).

The information gathered from the interviews was structured and examined with the help of Microsoft Excel 365 software. Graphs were generated to enhance the understanding and interpretation of both qualitative and quantitative findings.

Results

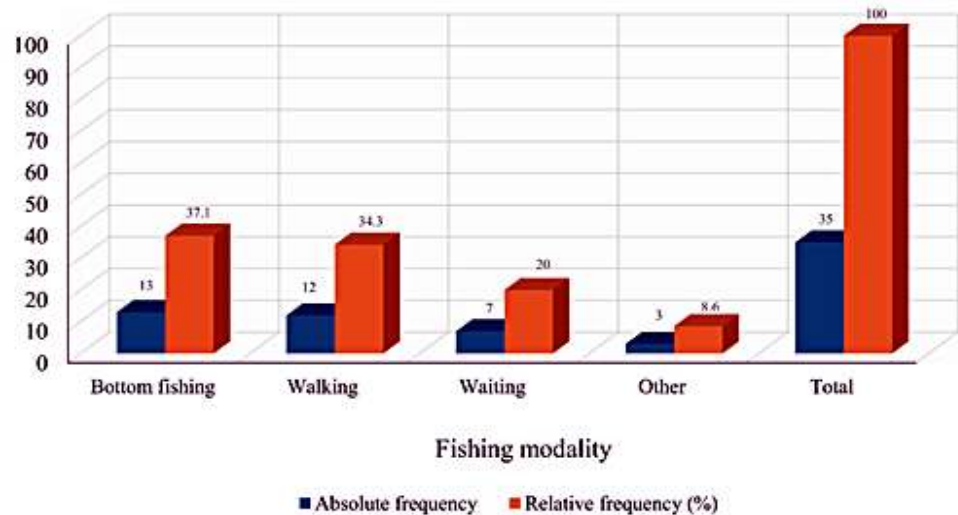
In the present study, conducted in northeastern Pará, 35 fishermen were interviewed, revealing that hand lines/hooks are the primary method for catching Tucunaré, with 68.6% of respondents (n = 24) using this technique. Branch/buoy hooks were mentioned by 17.1% (n = 6) of fishermen, while the cast net, primarily used for bait, was reported by 8.6% (n = 3). The Gillnetting was the least commonly used method, mentioned by only 5.7% (n = 2) of fishermen. These findings highlight the significance of handline/hook fishing as a traditional artisanal practice crucial for the subsistence of traditional communities in the area (Figure 1).

Figure 1. Traditional fishing methods used to catch Tucunaré (*Cichla ocellaris*) in the riverside communities of the village of Remédios and the village of São Raimundo de Borralhos, northeastern Pará, Brazil



Among the 35 fishermen interviewed, it was noted that the primary artisanal fishing technique for Tucunaré was bottom fishing, practiced by 37.1% of respondents (n = 13). Walking fishing was the next most common method, reported by 34.3% (n = 12), which was nearly as prevalent as the first method. Waiting fishing was mentioned by 20.0% of fishermen (n = 7), while other less common methods of capture made up 8.6% (n = 3). These findings suggest a variety of artisanal fishing approaches used by local communities, with a focus on methods that offer greater control and selectivity in catching Tucunaré (Figure 2).

Figure 2. Artisanal fishing methods used to catch Tucunaré (*Cichla ocellaris*) in the riverside communities of the village of Remédios and the village of São Raimundo de Borralhos, northeastern Pará, Brazil.



Among the habitats surveyed for catching Tucunaré, marginal lakes were the most commonly mentioned, cited by 42.9% of participants ($n = 15$). Backwaters were the next most popular, utilized by 28.6% of fishermen ($n = 10$). Igarapés (Creeks) represented 17.1% of responses ($n = 6$), while submerged branches made up 11.4% ($n = 4$). These findings indicate a preference for more open and productive habitats, like lakes and backwaters, although smaller areas, such as streams and branches, also play a significant role in local fishing practices (Figure 3).

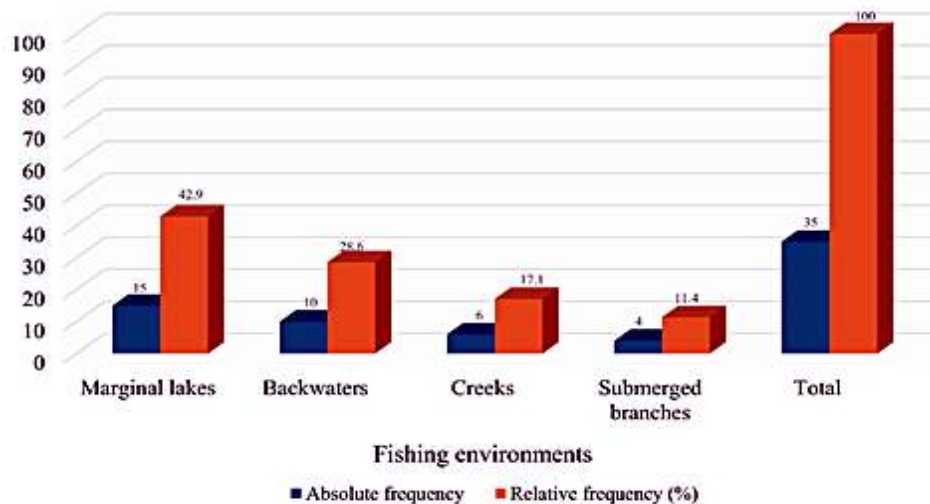
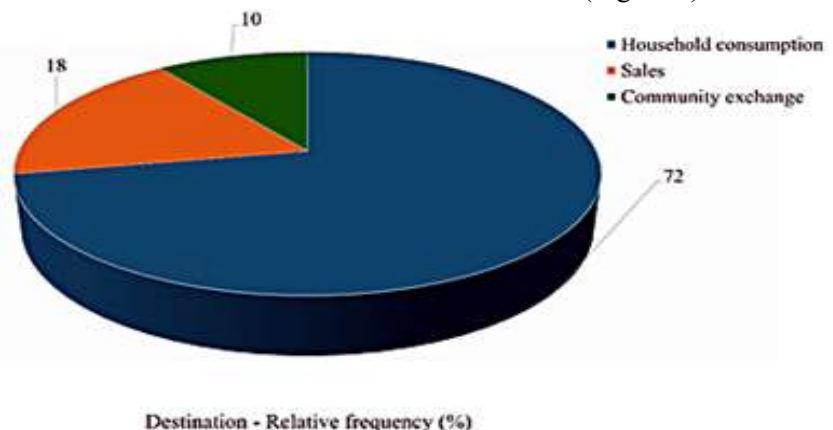


Figure 3. Fishing environments for Tucunaré (*Cichla ocellaris*) in the riverside communities of the village of Remédios and the village of São Raimundo de Borralhos, northeastern Pará, Brazil.

Regarding the destination of the Tucunaré caught, it was discovered that the majority of the fish is used for domestic consumption, making up 72.0% of the total reported by participants. Sales made up 18.0%, indicating that the commercialization of Tucunaré is done on a smaller scale and as a supplementary source of income. Community exchange was cited by 10.0% of fishermen, showing that this tradition continues to be a method for fostering solidarity and enhancing social connections within traditional communities (Figure 4).

Figure 4. Destination of Tucunaré (*Cichla ocellaris*) caught in the riverside communities of the village of Remédios and the village of São Raimundo de Borralhos, northeastern Pará, Brazil.



Discussion

This study offers a distinct viewpoint on artisanal Tucunaré (*C. ocellaris*) fishing in northeastern Pará, emphasizing its significance to traditional communities in terms of both socioeconomic and cultural aspects. The study underscores the role of artisanal peacock bass fishing in ensuring food security, generating additional income, and maintaining cultural heritage (Figure 5). Fishing for Tucunaré in the Amazon and northeastern Pará regions is predominantly carried out with hand lines/hooks, especially in traditional communities, due to their low cost, ease of use, and efficiency in natural environments such as rivers, lakes, and streams (Inomata et al., 2020; Silvano and Hallwass, 2020). This highlights the significance of artisanal Tucunaré fishing in communities (Mesquita and Isaac-Nahum, 2015), safeguarding traditional cultural practices.

Figure 5. Artisanal capture of Tucunaré (*Cichla ocellaris*) in the riverside communities of the village of Remédios and the village of São Raimundo de Borralhos, northeastern Pará, Brazil.



This traditional fishing method is handed down through generations, underscoring its socio-cultural significance and ability to adapt to local economic conditions, while also supporting the sustainability of fish populations through selective practices primarily for family consumption (Silvano and Hallwass, 2020; Reis et al., 2022). The use of artificial lures, such as jigs and plugs, is common in both artisanal and sport fishing, with catch-and-release sport fishing being a growing practice, with low post-capture mortality rates for Tucunaré (Thomé-Souza et al., 2014; Barroco et al., 2017).

Methods such as branch hooks/buoys are used in a complementary manner, allowing for the passive capture of medium-sized fish while the fisherman performs other activities. The use of cast nets and gillnets is less frequent, as it requires greater financial investment and physical effort and can cause negative impacts on the ichthyofauna, such as the capture of non-target species. Thus, the predominance of hand lines/hooks reflects not only a subsistence strategy but also an adaptation to the economic and environmental needs of communities, contributing to the maintenance of Tucunaré stocks and the sustainability of regional fisheries (Isaac et al., 2015; Silvano and Hallwass, 2020; Inomata et al., 2020).

The prevalence of specific artisanal fishing methods, like fixed nets (fixed-point fishing), is due to their convenience and energy efficiency. This allows fishermen to target specific areas with less effort and greater precision, as they have direct control over when the catch is made, reducing the amount of unwanted catches (Almeida Neto et al., 2018). Adaptive and flexible strategies are striking characteristics of traditional communities, which adjust their techniques according to the availability of resources and environmental conditions, using different methods such as nets, hooks, traps, and, in some cases, prohibited techniques, to maximize productivity and ensure subsistence (Cunha et al., 2016; Almeida Neto et al., 2018; Alemu, 2025).

Walking, although less frequent, is relevant in areas with lower fish concentrations, as it allows for the exploration of different environments along the route, demonstrating the adaptability of fishermen to the population dynamics of target species (Almeida Neto et al., 2018; Alemu, 2025). More passive methods, such as waiting fishing, tend to be less representative due to lower productivity, reflecting strategic choices based on efficiency and the individual needs of fishermen (Almeida Neto et al., 2018). The importance of flexibility and traditional knowledge for the sustainability of artisanal fishing is underscored by the diverse range of techniques and the selection of the most suitable method for each situation (Almeida Neto et al., 2018; Alemu, 2025). These practices highlight the need for specific management policies and support for community organization to ensure the sustainability of fishery resources and the socioeconomic resilience of artisanal fishers (Cunha et al., 2016; Alemu, 2025).

Research on Tucunaré fishing environments highlights that marginal lakes and blackwater environments have the highest catches and productivity, especially during the ebb tide, when food resources are plentiful and

access is easier (Dias et al., 2020). The traditional knowledge of fishermen, combined with observation of hydrological regimes, contributes to the choice of the best fishing periods and locations, reflecting an interaction between ecological and cultural factors. Backwaters and areas with submerged vegetation are valued for their high primary productivity and niche diversity, functioning as refuges and foraging areas, while streams, although less exploited, play an important role in the connectivity between aquatic habitats (Dias et al., 2020; Catelani et al., 2021).

In addition, structured habitats, such as submerged branches, provide shelter and strategic ambush points, consistent with the predatory behavior of Tucunaré. The ecological adaptability of the species, including physiological and behavioral plasticity, favors its success in varied environments, including invaded areas outside the Amazon (Escobar-Camacho et al., 2019; Catelani et al., 2021). Thus, the selection of fishing environments reflects both the ecological dynamics of Tucunaré and the adaptability and knowledge of artisanal fishermen, reinforcing the importance of integrating traditional knowledge and science for the sustainable management of the species (Dias et al., 2020; Catelani et al., 2021).

The choice of fishing environments reflects an interaction between ecological factors (availability of resources, habitat structure, seasonal variation in river levels) and cultural factors, such as fishermen's traditional knowledge of periods and locations of greatest abundance of the species (Dias et al., 2020). Furthermore, the adaptability and physiological flexibility of Tucunaré enable it to thrive in various habitats, even those that have been modified or invaded (Isaac et al. 2015; Escobar-Camacho et al., 2019; Castro et al., 2020).

Artisanal fishing for Tucunaré in northeastern Pará is a traditional and cost-effective practice that supports local communities. Using selective techniques like hand lines/hooks, fishermen demonstrate their empirical knowledge of Tucunaré's ecological habits, relying on habitats like marginal lakes and tidal flats for feeding and reproduction. Fish are mainly sold locally, with self-consumption being predominant, but there are also small-scale sales and community exchanges, which highlights the importance of Tucunaré not only as a food resource, but also as an element of social cohesion and economic complementarity (Braga and Chagas, 2023). The traditional knowledge of fishermen regarding the habitats and peak abundance times of Tucunaré helps promote more sustainable management techniques and the passing down of cultural wisdom (Mesquita and Isaac-Nahum, 2015; Silvano and Hallwass, 2020). The integration of local knowledge into monitoring and management strategies can strengthen the sustainability of artisanal fisheries and the resilience of communities in the face of environmental changes and economic pressures (Isaac et al., 2015; Silvano and Hallwass, 2020).

Conclusion

Artisanal fishing for Tucunaré (*Cichla ocellaris*) in northeastern Pará is a key activity for traditional communities, practiced mainly with hand lines and intended for domestic consumption. In addition to its role in providing food, the activity retains cultural and economic importance, reinforcing the need to strengthen community fishing agreements and public policies that ensure its sustainability.

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