

Fishing characterization in a fishing community in the town of Paço do Lumiar, Maranhão, Brazil**Caracterização da pesca em uma comunidade de pesqueira na cidade do Paço do Lumiar, Maranhão, Brasil**

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ABSTRACT

Artisanal fishing is one of the main economic activities in Brazilian communities and it is also an important source of animal protein. The community of Mocajituba, located in the municipality of Paço do Lumiar, in the locality there is an association responsible for the organization of the activity in the region. The main catches in this community are fish and shellfish. Thus, his study aimed to characterize the fishing fleet, the main species landed and the fishing trade in order to provide necessary support for the creation of management plans to enable the strengthening of fishing in the community. Data were collected through the application of questionnaires and analyzed qualitatively and quantitatively. A total of 99 fishermen were interviewed and the results showed that artisanal fishing is a source of income and food for the community. They use small boats in areas near the local port with limited fishing gear. The Data indicate the importance of the elaboration of a plan for management of shared resources, resulting in the valorization of the artisanal fisherman and sustainability of the fishing activity.

Keywords: Artisanal fishing, Fishing resources, Production.**RESUMO**

A pesca artesanal é uma das principais atividades econômicas das comunidades brasileiras e também uma importante fonte de proteína animal. A comunidade de Mocajituba, é localizada no município de Paço do Lumiar. Na localidade existe uma associação responsável pela organização da atividade na região. As principais capturas nesta comunidade são peixes e crustáceos. Assim, esse estudo teve como objetivo caracterizar a frota pesqueira, as principais espécies desembarcadas e o comércio pesqueiro de forma a dar o suporte necessário à elaboração de planos de gestão que viabilizem o fortalecimento da pesca na comunidade. Os dados foram coletados por meio da aplicação de questionários e analisados qualitativa e quantitativamente. Foram entrevistados 99 pescadores e os resultados mostraram que a pesca artesanal é fonte de renda e alimento para a comunidade. Eles usam pequenos barcos em áreas próximas ao porto local, com equipamentos de pesca limitados. Os dados indicam a importância da elaboração de um plano de gestão de recursos compartilhados, resultando na valorização do pescador artesanal e na sustentabilidade da atividade pesqueira.

Palavras Chave: Pesca artesanal, Produção, Recursos Pesqueiros.**1 INTRODUCTION**

The Brazilian State of Maranhão has the second longest coastline of Brazil, with 640 km of coastline, and it accounts for 92% of artisanal fisheries production on the Brazilian coast (ALMEIDA et al., 2006). The geographical and physiographic characteristics of this region favor the occurrence of a wide range of fish, crustaceans, and mollusks of high commercial value. Among the factors that guarantee this high productivity are the presence of mangrove creeks, a large number of rivers that flow into the sea making it available a lot of essential nutrients for the maintenance of

the marine food chain, the great extent of the continental shelf and the presence of a huge estuarine area associated with high tides amplitudes (CASTRO, 2001, SILVA et al., 2007).

According to Santos et al. (2011), there are 200 fishing communities established in Maranhão coast, and Mocajituba community is one of them. Mocajituba is located in the town of Paço do Lumiar. The main catches in this locality are fish, crustaceans, and mollusks. Fishing gear and boats used by fishermen, seafood restaurants and collectors are, basically, artisanal and most people say they have no other source of income besides fishing. In Mocajituba there is a fishing community that contributes to the organization of the fishing activities in the town, and there is also an Association of Artisanal Fisheries and Aquaculture, linked to the State Department of Production and Supply (BOULLOSA, 2012).

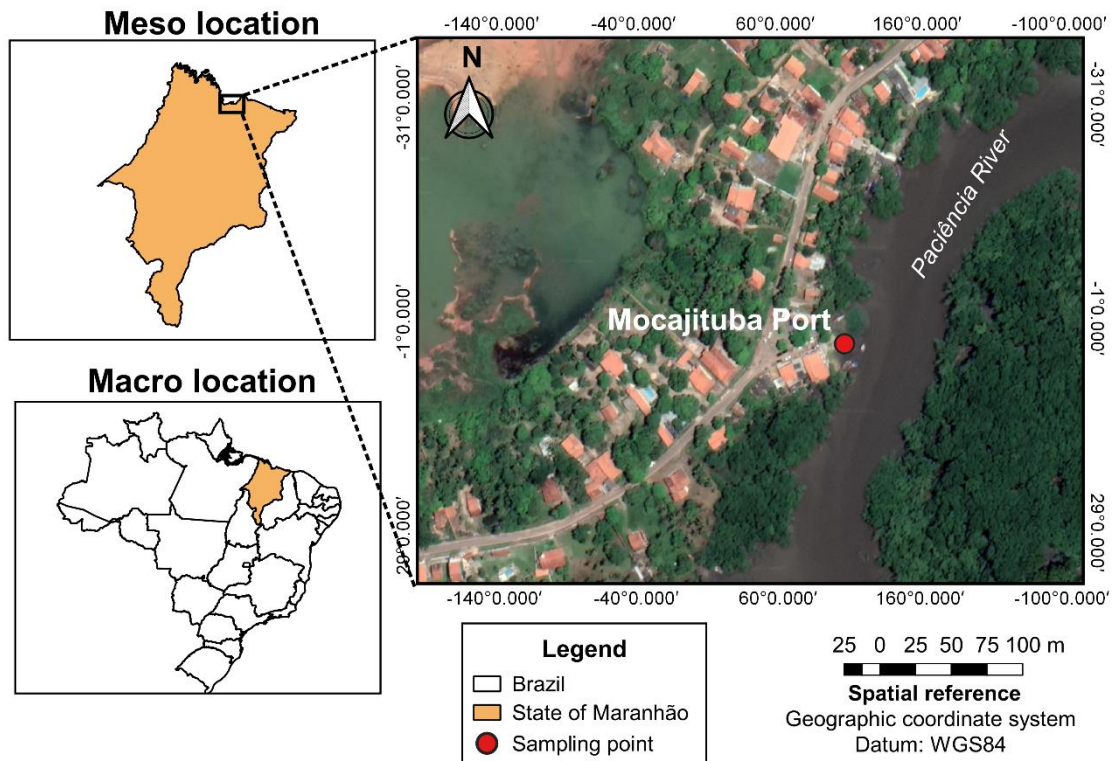
On the coast of Maranhão fishing is mostly artisanal. The exploration is carried out by methods and rudimentary fishing gear, with little capture power (NUNES, 2007), using primitive arts such as corral to catch fish and drag nets to catch shrimps (SANTOS et al., 2008, MONTELES et al., 2009). Vessels are usually small, with propulsion to sailing, rowing or low horsepower engines. It is a limited activity when compared to industrial fishing, but it has a key role in job creation and income for thousands of families in Maranhão (SANTOS et al., 2011). Nevertheless, IBAMA (2005) report that in 2000 the state of Maranhão was Brazil's third largest fish producer.

Therefore, this study aimed to characterize the fishing fleet, the main species landed and the fishing trade in order to provide necessary support for the creation of management plans to enable the strengthening of fishing in the Mocajituba community.

2 METHODOLOGY

Visits were made to Mocajituba community (Figura 1) in order to observe the fishing community and then develop a specific questionnaire. The questionnaires were composed of 34 questions about the role of the people in fishing, time spent in the activity, fishing period, type of vessel used for fishing, fishing gear used, fishing locations, species caught, species caught accidentally and issues related to the fishing trade.

Figure 1. Location of the Study area. Port of Mocajituba, Paço of Lumiar, MA, Brazil



Interviews were conducted with residents that meet certain criteria for the establishment of this research. To be able to participate he/she had to be Mocajituba resident, be over 18 years old, who does or has done any activity related to fishing.

Data were analyzed qualitatively and quantitatively seeking to represent the consensus among the participants. The information from the interviews was analyzed as a percentage of mentioned answers. Thus, most of the answers or more aspects mentioned will be considered most relevant about the local ecological knowledge (PEACE; BEGOSSI, 1996, SILVANO; BEGOSSI, 2005).

3 RESULTS

Data collection was carried out in Mocajituba community, located in the town of Paço do Lumiar, in the Brazilian State of Maranhão. A total of 99 interviews was conducted. Artisanal fishing in the region is performed by different age groups, with the majority being male (72%). In addition, all participants were Mocajituba's residents.

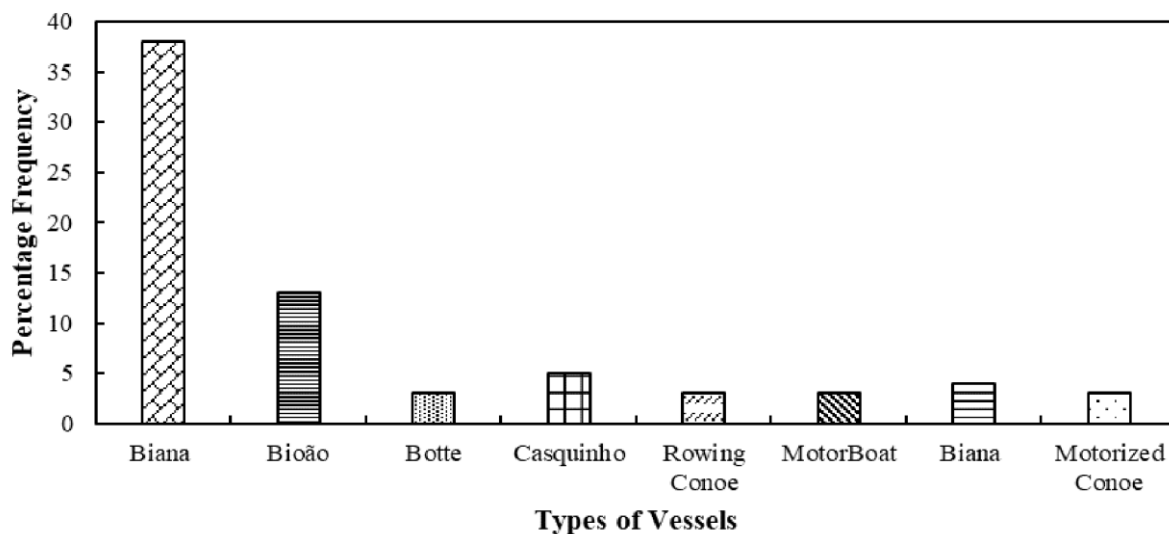
Fishing in Mocajituba port is considered artisanal, with small boats operating in areas near the port. The products caught are traded mainly in the main port of the community. However, most

of these products are delivered to middlemen (70%), and only 30% of the products caught is traded by the fishermen.

Fishermen who live exclusively from artisanal fisheries account for over 50% of the participants and only 11% have children involved with fishing. In the community, there are three categories of artisanal fishermen: shellfish gatherers (15%), crab pickers (15%) and fishermen (70%). Most artisanal fishermen of the region use gill nets, weir nets, cast nets and dragnets (54%).

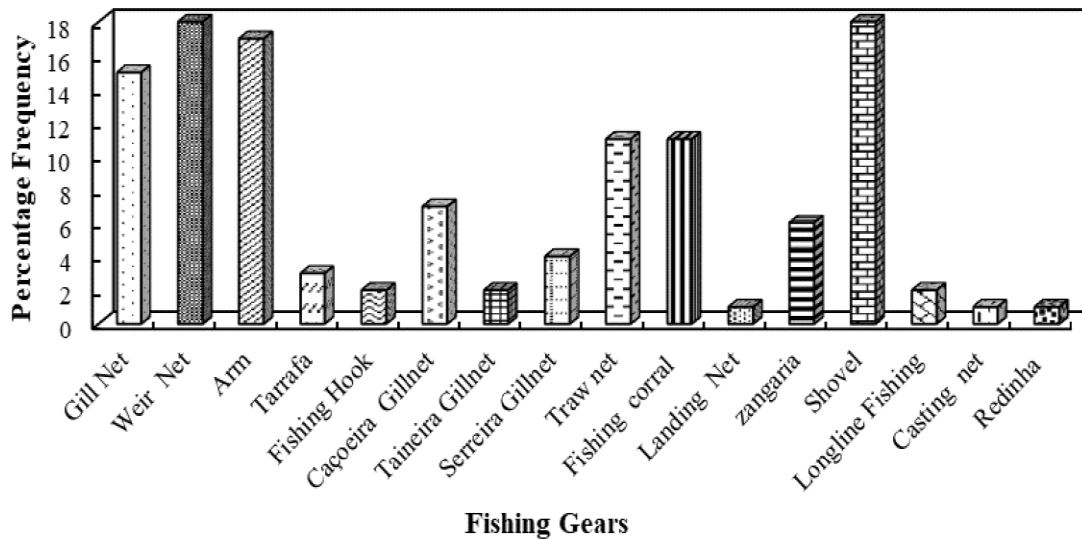
The vessels most cited by the respondents are local vessels known as *biana*, *boiao*, and *casquinho* with or without engine (Figure 2). Regarding the time the participants have been working in the fishing activity, most of them fall into the class between 11 to 40 years, representing 47% of the total. Regarding working days, 58% of them performs fishing activities weekly, taking around 6 hours to go to the fishing locations, staying from 3 to 8 days. About 47% of the participants always go fishing with the same people. Through the interviews, the following fisheries locations were identified: Humberto de Campos, Carrapatal (Santana Lighthouse), Mocajituba and Curupu. These areas are still considered by fishermen as the best locations for fishing. Regarding the best period of the year for fishing, 44% prefer the dry season.

Figure 2. Boats used in the fishing community of Mocajituba, Paço of Lumiar, MA, Brazil



Different types of fishing gear (Figure 3) were mentioned by the fishermen. Each type is used for a specific purpose, for example, to capture a specific target species.

Figure 3. Fishing gears used in the fishing community of Mocajituba, Paço of Lumiar, MA, Brazil.



According to the fishermen, the most captured species were catfish, mentioned by 24% of participants, mullet (14%), sawfish (8%), mussels and sarnambi 8%, and yellow hake (3%). Other species of reduced economic value were also mentioned representing 43% (table 1).

Table 1. Species caught in the fishing community of Mocajituba, Paço of Lumiar, MA, Brazil

Species	N	%
Catfish	79	24
Mullet	46	14
Cangata	2	1
Crab	19	6
mussels / saranambi	25	8
Pacamão	17	5
yellow hake	10	3
Shrimp	9	9
Sardine	12	11
Guaravira	15	12
Others	133	7

4 DISCUSSION

The fishing fleet has a wide variety of forms, but it has been classified differently in the few studies on fishing on the coast of Maranhão coast (STRIDE, 1992). It is important to mention that some of the fishermen were not able to answer the questions about the physical characteristics of the vessels. According to the local fishermen, the materials used for fishing nowadays are more sophisticated than in the past, for example, now they are able to use fishing canoes and motor boats.

The fishermen in Mocajituba basically use weir and gill nets for fishing and, those who declare themselves as shellfish gatherers or crab pickers use mainly their arms and shovels. Fishing using weir and gill nets can be considered predatory fishing when there is not adequate control of the net size and internode length. That may be a problem since many fishermen have knowledge only about the size of the net, knowing little or nothing about internode length. Thus, they end up catching non-target species in the fisheries. In his study on the fishing aspects of coastal cities in Maranhão Almeida (2009) observed that it is common and also observed that the fishing gears used by some fishermen may close some sections of the rivers and because these fishing gears have small meshes, the development of juvenile fish species is affected.

The community pickers perform a technique created by the Tupinambás Indians who inhabited the Brazilian coast (SOUZA, 2000). This technique consists of introducing the pickers arm into the crab holes to catch the crabs by hand (MAGALHÃES et al., 2011). This type of fishery is considered less predatory to the species since less mortality occurs and the crab pickers can select the size and sex of the specimen. The shovel is used as an aid in the collection of shellfish by shellfish gatherers, a characteristic that differs from other regions in Brazil where the professionals use other items such as spoons and machete (MARTÍNS; ALVIM, 2016), thus making this characteristic peculiar to fishing communities in the state of Maranhão. However, despite being manual collection techniques, the collections of shellfish with shovels can be harmful to the environment when it removes layers from the environment substrate (ALMEIDA, 2009).

It is important to know how the fishermen use the fishing gear available in order to allow more realistic management strategies to the characteristics of the region (BATISTA, 1998). The community of Mocajituba still lacks information on how to best manage and use the fishing gear to avoid the decline of many species commercially important.

Regarding the fishery resources captured by the local fishermen, a great diversity is observed, with catfish being caught more frequently. The family Ariidae has greater representativeness, which is demonstrated by the catfish, quite mentioned by the fishermen, characterized by them as a very abundant resource. Among the representatives of the family Ariidae most cited by the fishermen is the guild catfish. Although this species is very representative in the fisheries of the community of Mocajituba, Monteles et al. (2010) observed a decrease in the catches on the eastern coast of Maranhão, in the town of Humberto de Campos. This author observed also a decrease of the catches of guaravira, a species that was also frequently mentioned by the fishermen of Mocajituba, belonging to the family of the Trichiuridae. The Mugilidae family was the second most representative, being represented by the mullet, a species that according to the data was

considered as target species and, it is responsible for the greater profitability of the community. Sururu and Sarnambi are species that are widely captured by the community and are species mainly caught by women, who are as important as the fisherman for the subsistence of their families.

- **Profession of fisherman**

According to the Brazilian Classification of Occupations (CBO), the profession of fisherman includes crab pickers, shellfish gatherers, artisanal lobster fishermen, and artisanal fish and shrimp fishermen. According to SEAP (2010), the artisanal fisherman is the professional licensed by the Ministry of Fisheries and Aquaculture who fishes for commercial purposes, autonomously or for own consumption and family income, with their own means of production or through a partnership agreement, landed or with small vessels. Pena (2011) reports that the work is carried out in a team, without supervision and the activities are held outdoors during the day. According to this author, the artisanal fishermen, during the activity, remain in uncomfortable positions, exposed to climatic variation and injuries (PENA, 2011; CARVALHO et al., 2014).

According to Lopes (2004), artisanal fishing can be classified as Artisanal Subsistence Fishing and Artisanal Commercial or Small Scale Fishing. Artisanal subsistence fishing has the main purpose of obtaining food for own consumption. Eventually, there may be marketing of the surplus products. It is performed with rudimentary techniques, has little commercial purpose and the eventual trade is carried out by the fishermen themselves (LOPES, 2004).

It is noted that the fishing activity is classified according to the equipment used in the fisheries and the purposes of the fish (RODRIGUES, 2011). Small Scale Fishing includes the obtaining of food for own consumption and fish trading. The fishermen use medium-sized boats from shipyards or boats built by themselves. The boats may have mechanized or non-mechanized propulsion. The equipment and supplies used do not have any sophistication. They usually use basic navigation equipment, in wooden boats, with a structure capable of storing fair amounts of fish. The Brazilian fleet is formed mainly by these types of boats, which account for approximately 60% of the national catch volume (LOPES, 2004).

- **Crab pickers**

Crab pickers are the professionals who collect crustaceans, such as crabs and bivalve mollusks, such as oyster or mussel. Although their work in many aspects is similar to the one carried out by the artisanal fishermen, there is a segregation of this group. They do not participate in production organizations and are not identified as fishermen.

- **Shellfish gatherers**

The work performed by the shellfish gatherers includes the preparation of the materials for the collection until the final product for sale, being carried out at home or in other places (FALCÃO, 2014).

Once the shells are collected, they are subject to the following steps: second washing, cooking, and separation. As observed during the field research and application of the questionnaires, the professionals get together to carry out the separation and organization of the working instruments for the collection of shellfish, packaging, and storage of the final product, including the purchase and resale of the product. Part of the work process done by the shellfish gatherers is carried out at home or in nearby areas thus the shellfish gatherers houses are considered units of food production (FALCÃO, 2014).

According to Pena et al. (2011), shellfish gatherers do not have vacations, weekly rest or paid holidays. If they get sick, they will not be able to do their job, which implies in the loss of the corresponding production (PENA et al., 2011; CARVALHO et al., 2014), compromising the food security and leading to loss of money. According to this author, the value of the work is in the final product that is sold or consumed by the family, however, due to the difficulty of storage and conservation of the shellfish and the sale of the product to the middlemen, the value is depreciated. These processes, called processing stages, performed individually or in family groups, either with fish or shellfish, are usually carried out without adequate infrastructure and hygienic-sanitary conditions (BANDEIRA, 2009).

In addition to work as shellfish gatherers, an activity that requires a great deal of physical effort, since there is no equipment in the activity that enhances the extraction or transport of shellfish, the women also have to do the house chores, which are often exclusively done only by women (MARQUES, 2015). Although they perform the work with great representativeness for the survival of the family, the role of the shellfish gatherers is still in the process of achieving recognition.

- **Boat owner**

The work of the owner of the vessel consists of renting the boats (canoes, bianas, and others), and sometimes the fishing gear, thus the artisanal fishermen who do not have these instruments will be able to carry out the fishery.

- **Middleman/ fisherman**

The middlemen are the people who buy and resell the fish that are landed. Most fishermen point out the middlemen as a problem (ANDREOLI, 2007). However, in the study area, the fishermen consider the work of the middlemen important, since they have no other way of selling their products.

- **Questionnaire answers regarding the professional future of the fishermen's children**

The conditions of work in fishing reflect in the reduction of the number of children of fishermen that want to continue doing what their parents do, as demonstrated by Sacco dos Anjos et al. (2004). The economic situation of the artisanal fisherman takes a critical level that induces the children to choose other professions. The abandonment of fishing occurs, first, when the children engage in other economic activities (CAPELLESSO, 2011).

As observed in the answers given by the Mocajituba fishermen, they do not want their children to continue in this occupation as a means of subsistence. However, they do want to pass on the lessons they learned from their parents, once. The lack of artisanal fishermen in the study area could compromise the permanence of this traditional way of production (CAPELLESSO, 2011).

Regarding the fish trading, it was observed that most of the fishermen sell their products right before they go out fishing. All the products are delivered to middlemen who sell them in fish markets. Thus, the middleman is an important figure in the trading process. The fishermen arrive exhausted from fishing, so they have no conditions to store, transport, and trade the fish. The other respondents, the crab pickers and the shellfish gatherers, report that they trade the mollusks and crustaceans by themselves, at home or local markets.

5 CONCLUSIONS

From the results of this research, it can be concluded that small scale fishing is one of the main economic activities in the Mocajituba community. The fishing fleet in this community is quite variable as well as the types of fishing gear used. Gill nets and weir nets are the fishing gears most used by the fishermen. Although they use many types of fishing gear, they usually catch the same species.

It was observed that most women express pleasure or satisfaction about fishing, but the devaluation of the profession makes them not want this profession for their children, leading them often to choose other occupations.

The fishermen usually trade their products with the middlemen right before they go out fishing. The fishermen consider the role of the middlemen of great importance once they have no other way to sell their products. Therefore, fishermen and middleman have a good relationship in the community.

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