

THE SMALL-SCALE FISHERY OF ESTUARINE ISLANDS IN THE AMAZON ESTUARY – BRAZIL

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Introduction

The small-scale fishing is responsible for more than a half of the global catch and is destined almost entirely for human consumption (FAO, 2008). In Brazil, artisanal fishing is responsible for 64% of the catch and the small scale fishery in the Amazon region follows the global trend, accounting for 88.7% of the catch (IBAMA, 2007). Besides the high economic importance to the region, the small-scale fishing also represents food security and additional income for coastal communities.

Considering the insular region, near the city of Belém (Amazon estuary), fishery resources are mainly used for subsistence and eventually as a source of additional income.

This study aimed to identify the different methods of fishing in the islands of Combu, Ilha das Onças and Mosqueiro (Amazon estuary) considering the economic, social, ecological and technological aspects and the importance of this activity for the insular communities.

Study area

The city of Belém (Pará, Brazil) is the largest city in the Amazon region, with approximately 1.4 million inhabitants and is part of the complex Amazon estuarine region (IBGE, 2009). This study was carried out on three islands located around the city of Belém: Ilha das Onças, Combu and Mosqueiro islands (Figure 1).

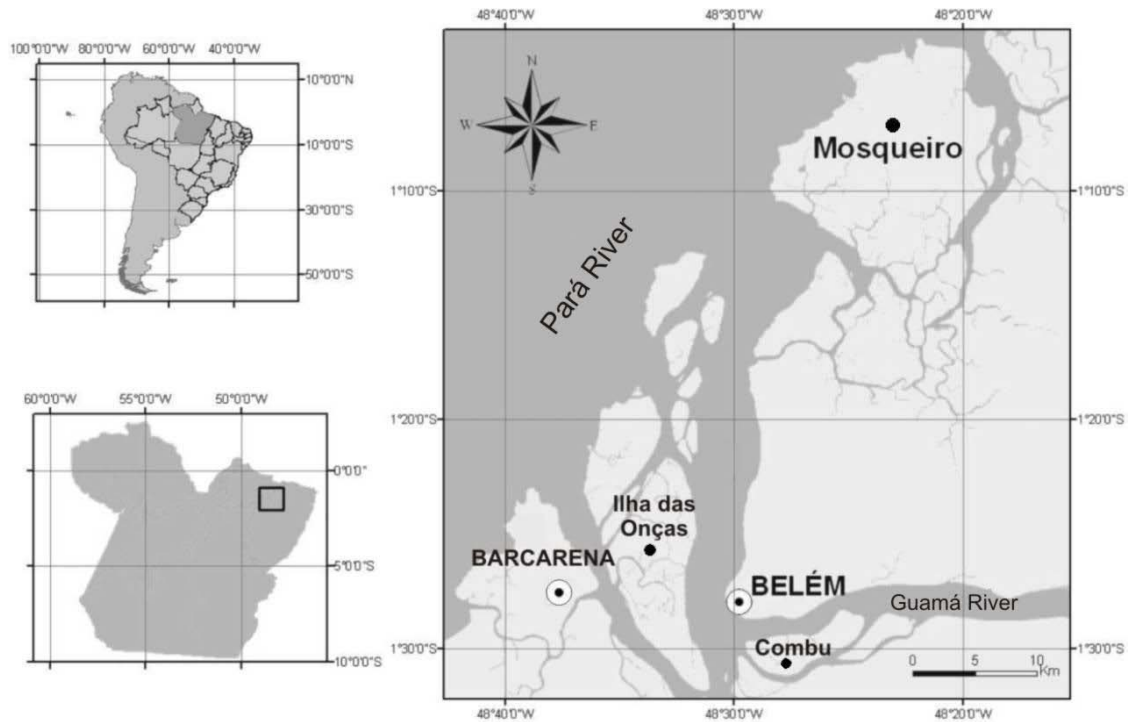


Figure 1: The study area: Combu, Ilha das Onças and Mosqueiro islands.

Survey and data processing

Interviews with the fishermen of the three islands were carried out aiming the identification of the resources exploited, fishing techniques, seasonality of activity and also the importance of the fisheries as commercial and subsistence activity.

For Combu and Ilha das Onças islands, a local resident, who served as guide, identified the local fishermen. For every fisherman interviewed, others fishermen were identified and a total of 34 and 52 individuals were interviewed respectively in Combu and Ilha das Onças islands. On the island of Mosqueiro, 60 fishermen were interviewed in the landing site most important in the region.

Data collected were qualitative and quantitatively analyzed using basis statistic.

Results and discussion

Five methods of fishing were identified in the island of Combu, six methods in the island of Ilha das Onças and four in Mosqueiro (Table 1). The long line and gillnet fishing were subdivided according to the goal of fishing: subsistence or commercial purpose. Depending on the objective, the fishing device has different dimensions. For commercial purposes, the length of the nets and long lines and, the size of mesh and hooks are higher when compared with fishery for subsistence (Table 1).

Table 1: Characteristics of the fisheries in the islands of Combu, Ilha das Onças and Mosqueiro. Can= canoe, CMot = motorized canoe, SB = small sized boat and MB = medium sized boat. * Mesh size (mm, stretched mesh size). + Number of the hook.

Island	Fishing technique	Fleet	Purpose of fishing	Resources exploited	Environment	Working relationship
Combu	Matapi (shrimp trap)	Can and CMot	Subsistence and Commercial	<i>Macrobrachium amazonicum</i>	Main channel and creek	Individual and family
	Block net	Can and CMot	Subsistence	Various fish species	Creek	Family
	Gill net (25, 30, 35, 40)*	Can and CMot	Subsistence	Various species of fishes	Main channel	Family
	Longline (7, 8, 9) ⁺	CMot	Subsistence	<i>Brachyplatystoma rousseauxii</i> e <i>Brachyplatystoma vaillantii</i>	Main channel	Individual and family
	Longline (0, 2, 3) ⁺	CMot	Commercial	<i>Brachyplatystoma filamentosum</i>	Main channel	Individual and family
Onças	Matapi	Can and CMot	Subsistence and Commercial	<i>Macrobrachium amazonicum</i>	Main channel and creek	Individual and family
	Block net	Can and CMot	Subsistence	Various fish species	Creek	Family
	Gill net (25, 30, 35, 40)*	CMot	Subsistence	Various fish species	Main channel	Family
	Gill net (30, 35, 40, 45, 50, 60)*	SB	Commercial	Various fish species	Bay	Family
	Longline (7, 8, 14) ⁺	Can and CMot	Subsistence	<i>Brachyplatystoma rousseauxii</i> e <i>Brachyplatystoma vaillantii</i>	Main channel	Individual and family
	Longline (3, 5) ⁺	Can and CMot	Commercial	<i>Brachyplatystoma rousseauxii</i> , <i>Brachyplatystoma vaillantii</i> e <i>Brachyplatystoma filamentosum</i>	Bay	Individual and family
Mosqueiro	Matapi	Can and CMot	Commercial	<i>Macrobrachium amazonicum</i>	Creek	Alone
	Gill net (45, 50, 60, 70, 80)*	SB and MB	Commercial	Peixes diversos	Bay	Share system
	Longline (1 e 2) ⁺	Can and CMot	Commercial	<i>Brachyplatystoma filamentosum</i>	Beach and bay	Share system
	Longline (7 e 8) ⁺	Can and CMot	Commercial	Siluriformes	Beach and bay	Share system

The fishing in the islands of Combu and Ilha das Onças is a familiar activity used mainly for subsistence; only a few species are used for commercial purposes. Although

it is not the main economic activity, fishing in these islands has an essential importance for the local residents because it represents the food security for local families during periods between the harvests of açai (*Euterpe oleracea*).

On the island of Mosqueiro fishing is a commercial activity and the main source of income. On this island, fishing is not a family activity, as the fishermen are hired by owners of boats, but do not receive a fixed salary. Income depends of the production of the fishery and varies according to season. According to the fishermen of this island, the fishing season occurs during the months of August to December, the dry period in the Amazon region. During this period, boats from other parts of the State use this region as a fishing area, increasing fishing effort surrounding the island. However, despite the relevant fishing effort in the area, no initiative of traditional or government management is registered.

Fishing with Matapi (shrimp trap) is used in the three islands and the exploited resource is the Amazon shrimp (*Macrobrachium amazonicum*). In the islands of Combu and Ilha das Onças, this fishery is common by most residents, especially from January to June. These months correspond the off season of açai, and fishing activity is an essential source of income and protein. In these islands, the use of natural resources follows specific harvest periods or closed season, and considering both fishing and vegetal resources, this may be considered as natural or traditional management which has been contributing to the environmental sustainability in the area. On the island of Mosqueiro the fishing with Matapi has commercial purposes and is practiced throughout the year, but this gear is not the most common technique used. However, because of the commercial importance of this activity in the island, the average numbers of Matapi per fisherman, number of days fishing per month and therefore the production and income are higher when compared to the other islands (Table 2). Schooling and housing quality on the island of Mosqueiro also differs from other islands, probably due to better infrastructure and local access roads.

Table 2: Characteristics of the fishery with Matapi considering technological, social and economic aspects in the islands of Combu, Ilha das Onças and Mosqueiro (US \$ 1.00 = R\$ 1.76).

Aspect	Attribute	Description	COMBU	ONÇAS	MOSQUEIRO
			%	%	%
Tecnological	Fishermen	% of interviewed fishermen using this fishery	91	90	26.5
	Effort 1	Number of matapi per fisherman (average)	22	30	39
	Effort 2	Number of days fishing per month (average)	15	15	23
Social	Schooling	Illiterate	32	49	29
		Basic education	43	38	18
		Elementary School	25	11	35

		High school	0	2	18
	Housing type	Wood	100	98	88
		Brick	0	2	12
	Main economic activity	Açai	96.5	82	0
		Fishery	0	2	100
		Others	3.5	16	0
Economic	Production	Average monthly catch (Kg) per fisherman	50.2	46.54	286.8
	Income	Average monthly catch * mean price (US \$)	134.09	122.06	383.43

Fishery with block net is used by more than half of fishermen interviewed, only in the islands of Combu and Ilha das Onças. This practice is for subsistence only and, despite its low selective and predatory characteristic, fishermen limit its use to four or five times a year. This initiative is considered as traditional management. The characteristics of this fishery are similar in both islands (Table 3).

Table 3: Characteristics of the fishery with block net considering technological, social and economic aspects in the islands of Combu and Ilha das Onças.

Aspects	Attribute	Description	COMBU	ONÇAS
			%	%
Tecnological	Fishermen	% of interviewed fishermen using this fishery	44	44
	Effort 1	Mean net size (m)	40	40
	Effort 2	Average number of blocknet per fisherman per year	4	5
Social	Schooling	Illiterate	20	20
		Basic education	33	60
		Elementary School	40	20
		High school	7	0
	Housing type	Wood	87	100
		Brick	13	0
Economic	Main economic activity	Açai	80	83
		Fishery	7	0
		Others	13	17
	Production	Average monthly catch (Kg) per fisherman	6.2	11

Fishery with gill net is observed in the three islands; however there are differences in the size of mesh used and the purpose of fishing. In the islands of Combu and Ilha das Onças it is used small stretched mesh sizes (25-40 mm) and the catch is destined for subsistence, with a small commercial percentage. This practice is more common in the period from January to June (Table 4).

Table 4: Characteristics of gill net fishery for subsistence, considering the technological, social and economic aspects development in the islands of Combu and Ilha das Onças (US \$1.00 = R\$ 1.76).

Aspects	Attribute	Description	COMBU	ONÇAS
			%	%
Tecnological	Fishermen	% of interviewed fishermen using this fishery	65	75
	Effort 1	Mean net size (m)	95	121.5
	Effort2	Mean number of fishing days per month	8	8,7
Social	Schooling	Illiterate	25	36
		Basic education	40	50
		Elementary School	30	8
	Housing type	High school	5	6
		Wood	90	100
Economic	Main economic activity	Brick	10	0
		Açaí	90	80,5
		Fishery	5	0
	Production	Others	5	19,5
		Average monthly catch (Kg) per fisherman	40.8	33.7
	Income	Average monthly catch * mean price (US \$)	62.59	47.87

Commercial fishery with gillnet is used in the islands of Mosqueiro and Ilha das Onças. These nets are longer in size and the stretched mesh size is larger (45-80 mm) compared with fishing for subsistence. Also, the effort of this type of fishery is greater since this activity is commercial and is operated throughout the year (Table 5).

Table 5: Characteristics of gill net commercial fishery considering the technological, social and economic aspects development in the islands of Mosqueiro and Ilha das Onças (US \$ 1.00 = R\$ 1.76).

Aspects	Attribute	Description	ONÇAS	MOSQUEIRO
			%	%
Tecnological	Fishermen	% of interviewed fishermen using this fishery	11,5	47
	Effort 1	Mean net size (m)	700	1267.85
	Effort2	Mean number of fishing days per month	15	23.25
Social	Schooling	Illiterate	17	11
		Basic education	66	67
		Elementary School	17	22
	Housing type	High school	0	0
		Wood	83	33
Economic	Main economic activity	Brick	17	67
		Açaí	83	0
		Fishery	17	100
		Others	0	0

Production	Average monthly catch (Kg) per fisherman	150	264.5
Income	Average monthly catch * mean price (US \$)	397.16	450.57

The long line fishery is observed in all studied islands; however the number of fishermen using this technique is reduced. On Ilha das Onças and Combu Island, hooks are reduced in size, and catches are of small sized fish, with low commercial value and therefore are used for consumption. The commercial long line fishery uses larger sized hooks and the main species caught is piraiba catfish (*Brachyplatystoma filamentosum*), which has high commercial value. This fishery is reported throughout the year, mainly in September. In Mosqueiro, the long line fishery is all for commercial purposes and is practiced throughout the year.

Conclusions

The fishing in the islands of Combu and Ilha das Onças is a subsistence activity as the production is mainly used as a food source, and the main economic activity is the vegetal extraction. In these islands, the use of natural resources follows specific harvest periods or closed season, and considering both fishing and vegetal resources, this may be considered as natural or traditional management which has been contributing to the environmental sustainability in the area. On the island of Mosqueiro, fishing has great economic importance, and is mainly represented by the gillnet fishery (98% of total interviewed fishermen). These resources are also exploited by fishermen from other places and there are no initiatives of traditional or government management.

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