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Title of the paper: Do Fishers Have Territories? The Use of Fishing Grounds at Aventureiro (Ilha Grande, Brazil)

Stream: Fisheries

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Introduction

Fisher behavior is important in studies of fishery resources. The understanding of fishing strategies and fisher decisions about where, when, and length of time of fishing are important for the comprehension of fishing activities. Models that predict fishing responses to management, such as restrictions on effort and fishing grounds, also require this kind of information (Vignaux 1996). In this sense, the concept of territoriality is valuable in understanding artisanal fisher behavior and fishing strategies (Begossi 1995, 1996; Castro and Begossi 1995; Cordell 1985, McGrath *et al.* 1993).

Territory defense for reproductive or foraging purposes is very common in ecology. It is also common in human ecology. According to Akimichi (1984), the main purposes of human fisher territoriality are social and economic equity to resource access, avoidance of fights and conflicts, and resource conservation. Human territoriality has been reported in several areas previously considered as open-access (Acheson 1981; Akimichi 1984; Cordell 1985; McCay and Acheson 1987; Berkes 1989; Leveil and Orlove 1990; McGrath *et al.* 1993). The sea may be an open-access for some fishery types, but for others, individuals or communities have resource-tenure systems (Acheson 1981; McCay and Acheson 1987; Berkes 1989). These systems may be established by means of formal as well as informal rules. In some areas, however, fishers have local rules for the conduct of a fishery without the use of territories or other means of establishing tenure. In the common property literature, a number of mechanisms other than territories have been known to regulate the local use of fishery resources (Berkes 1989; Ostrom 1990; Bromley 1992).

The purpose of this study was to analyze the fisher behavior at Aventureiro (Ilha Grande, RJ, Brazil) in terms of the fishing spots used, specifically, we intended to observe if there were fishing grounds used exclusively by the same fishers or families, and if these fishers always used the same fishing spot. Additionally, we intended to analyze the circumstances under which fisheries took place, i.e., in terms of local geography, laws, informal rules, kin-relationship, etc.

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Study site

Aventureiro is a small fishing community (22 families, 39 fishers) located at Ilha Grande (23° 10'S, 44° 17' W), an island in front of the Angra dos Reis bay (Rio de Janeiro State southern coast, Brazil). This is an open sea and relatively isolated community. Maritime access to Aventureiro is limited by ocean conditions, and land access is restricted to hiking trails. There is no electricity, water provision or commercial place in Aventureiro. Its inhabitants depend on a neighbor community (Provetá - with over 250 house) or on the inland city of Angra do Reis to sell their products, to buy goods, and to have medical assistance. Aventureiro has only an elementary school, and the illiteracy level (20%) of its inhabitants does not differ much from those levels found in two other fishing communities also located at Rio de Janeiro State southern coast: Gamboa at Itacuruçá island (26%) and Jaguanum island (19%) (Begossi 1995).

Socially and economically, Aventureiro is a very homogenous community. Small-scale artisanal fishing and shifting cultivation are the main activities of the Aventureiro people, although some young fishers work in the large-scale Provetá sardine fishery. Using different types of gears, small-scale fisheries are carried out on coastal rocks, paddled canoes or small boats. Squid (“lula”) (*Loligo* sp.), spottail pinfish (“marimbá”) (*Diplodus argenteus*), horse-eye jack (“olhudo”) (*Caranx latus*), yellow chub (“parajica”) (*Kyphosus incisor*) and bluefish (“enchova”) (*Pomatomus saltatrix*) are the main species caught in the hot season months (October-March). In the cold season months (May-September), the main species caught are Spottail pinfish, mullet (“tainha”) (*Mugil platanus*), mackarel (“sororoca”) (*Scomberomorus brasiliensis*), grouper (“garoupa”) (*Epinephelus* spp.) and bluefish. Manioc is the basic cultivated crop, represented especially by *Manihot esculenta*.

Aventureiro is located inside a protected area (Reserva Biológica Estadual da Praia do Sul – RBEPS). This protected area is comprised of the coastal zone of a marine reserve (Parque Marinho do Aventureiro – 5 square nautical miles). The RBEPS area (3,600 ha) is mostly covered by secondary Atlantic Forest vegetation. Both the RBEPS and the Aventureiro marine reserve were created by government agencies in the last 20 years. These agencies established laws prohibiting Aventureiro people from hunting, practicing shifting cultivation, extracting forest products, and fishing either in the sea or in inland streams, i.e., all activities that they have been practicing for their subsistence over the past 150 years. Nonetheless, these laws are not enforced against Aventureiro people as one can see in the above description of their current activities. There is only one government agent living in the RBEPS who is supposed to monitor the entire area with the assistance of three Aventureiro natives hired by the State Government. These three natives, in turn, are kin-related to most of the Aventureiro families which have the same subsistence needs as themselves. Thus they are not likely to apprehend their relatives. In addition, controlling resource exploitation in a 3,600 ha area with only four men and without any vehicle is very difficult. Nonetheless, the four men try to monitor the RBEPS area against invasion by outsiders with some community help. In the case of the marine reserve, however, they lack the necessary equipment (e.g., boats) and the power to deal with and exclude outside sardine trawlers which sometimes fish inside that area.

Because Aventureiro is located inside the RBEPS, long-standing residents are allowed to stay but no one else is allowed to move in except relatives of residents. As a result, the population density there is very low. Because there are no facilities, tourism is very rudimentary. The only tourists who stay in Aventureiro, camp in the backyards of the natives' small houses.

Methods

Field work was carried out during one week every two months from September 1995 to July 1996. Data on fishing grounds, gears and transport methods used in each trip were collected during fishing landings from 6:30 a.m. to 9:00 p.m. Spots used by each fisher were organized according to fishing gears (frequency of visits). Interviews with 75% of the fishers (25 men and 4 women) about fishing conflicts and transmission of information about fishing conditions were also carried out.

Results

Results were based on data from 326 fishing landings. According to gears used, the main kinds of fisheries carried out were: hook and line used in 52% of the cases, “ripper hook” and line (“zangareio”) in 27%, and gillnets - both floating gillnet (“rede de espera”) and bottom gillnet (“corvinheira”) - in 17%.

All squid (*Loligo* sp.) fisheries (89 trips using “zangareio” and carried out from canoes and small boats) were performed at the same ground, "Largo do Aventureiro", by 22 different fishers, during the hot season months, especially in January. That is, all fishers obtained squid in one large, open-sea communal area near the community of Aventureiro. But there was no defense of this fishery ground against other fishers, either from the same community or the neighboring one (Provetá). As stated by an Aventureiro fisher: *"If there is squid here, the Provetá people come to fish here. When there is squid there, the Aventureiro people go there"*. When we analyzed other fisher's statements on tenure issues, we found out that almost 80% of them share information about fishing ground quality, but 20% did not.

In the case of hook and line and gillnets fishery we did not observe a fisher or a family using always the same site or territoriality (Tables 1, 2 and 3). The gillnet fishery used the rule of “first comer’s rights” to avoid conflict: *"If a fisher arrives to a ground and there already is somebody else gillnet set there, this fisher set his/her gillnet beside (continuously) the first one."* *"Nobody owns the place."*

Hook and line fishery was usually performed with only one fisher. Fishers who made more than three trips used at least three different grounds (Table 1). Fishing grounds visited by hook and line fishers were very similar in terms of their physical characteristics. All of them were adjacent to a rocky shore and in an area of 4 kilometers of shoreline.

Bottom-set gillnet fisheries were always performed by more than one fisher. The later was a specialized type of fishery carried out mainly by fishers from three families (C, D and E) who have boats, and by two other fishers (both from family P) employed by boat owners (Table 3). Bottom-set gillnet fishery used boats, rather than canoes. In this case, the utilization of fishing ground was associated to availability of a suitable type of boat and not related to informal tenure rules.

During field work, no conflict related to fishing activities was observed among Aventureiro fishers or between them and outside fishers.

Discussion

Territoriality in human populations does not necessarily mean an aggressive defense behavior. In some cases, rights over resources are obtained in aggressive encounters. However, in many cases, rights, rules and local norms regulate access to resources (Ostrom 1990).

Territorial behavior in fisheries may be related to the mobility of resources and gears,

purpose of fishing (subsistence, commercial or recreational), fisher density, diversity of resources, diversity of fishing grounds, and secrecy about the quality of fishing grounds. For example, in Búzios Island, a southeastern Brazilian fishing community, Begossi (1995) determined that the gillnet fishing sites were related to the informal ownership of fishing grounds by kin groups. She suggested later that there is a higher probability of territoriality in fisheries using stationary gear (e.g., gillnet), where grounds may be fixed, as compared to mobile gear fisheries (e.g., hook and line) (Begossi 1996). Not only the mobility of gears but also the species mobility affects fishery strategies and management. The distribution of most fishing resources in time and space is very unpredictable (Acheson 1981) and argued to be chaotic (Wilson *et al.* 1994). High mobile or migratory species seem to be more difficult to manage through local arrangements than species that do not cover a lot of ground (Pinkerton and Weinstein 1995).

In another example, in the community of Puruba, Begossi (1996) determined that the predominance of hook and line fisheries, high fauna diversity, diversity of fishing grounds, low local population density, and low recreational fisher density contribute to the lack of fishing territoriality. In other areas, high recreational fisher density provides incentive for territories (Castro and Begossi 1995). In the small-scale fishery at Aventureiro, all the same characteristics of Puruba fisheries exist, except for recreational fishing that hardly exists because Aventureiro is located inside a protected area.

Most of the studies on maritime fishing territoriality deal with commercial fisheries. Territorial rights are observed and practiced at community level in the commercial sardine and shrimp fisheries at Sepetiba Bay (Brazil) near Angra dos Reis Bay (Begossi 1996). At Aventureiro, fisheries, except squid, have mainly subsistence purposes. In squid fisheries, we did not perceive any informal arrangement limiting access to fishers from the neighboring community probably because there is an informal norm of reciprocity among fishers from both Aventureiro and Provetá (the latter also permit the former to fish in their community). This reciprocity may be a result of strong family ties among people of the two communities.

Although small boat fishery may have some commercial purpose, it is performed only by a few (four) boat owners. One then might ask why these boat owners do not fight or try to exclude some sardine trawlers that sometimes fish in the marine reserve area. One of the reasons we suggest is that they search for different species, i.e., they do not compete over the same resource. Another reason is that, in some cases, young Aventureiro fishers are part of the trawlers' crew.

Another way of determining territorial behavior is observing if information about fisheries is exchanged among fishers. Territories may be preserved under secrecy when fishers do not reveal information about the quality of fishing grounds, as it occurs in the Yaeyama fishery in Japan (Ruddle 1987). Notwithstanding, it does not seem to be a mechanism used by Aventureiro fishers. On the contrary, most of them share information with other community members. This reciprocity for sharing information is also found in sharing catches. In many circumstances, we observed fishers sharing their catches with others who did not go fishing on that day or who did not catch anything. In both information and catch sharing, reciprocity (a behavioral norm) helps to strengthen personal relationships and build group cohesion.

The fact that we did not find territoriality in Aventureiro fisheries at the scale of the protected area may be due to: (1) high unpredictability in time and space regarding distribution of fishing resources; (2) resource abundance (in terms of fauna and fishing ground) relative to numbers of fishers; (3) use of gears (except gillnet) which permits great mobility among fishing grounds; (4) non-commercial nature of the Aventureiro fisheries (except for squid); (5) lack of

conflicts with recreational fishers; and (6) strong ties among community members based on reciprocity. In addition, focusing on Akimichi's (1984) purposes for fisher territoriality, we did not observe a social or economic stratification among the community's members, neither fishery conflicts, nor a situation of resource over-exploitation.

It appears that limited and difficult access to the community and the creation of two protected areas (The RBEPS and the Marine Reserve of Aventureiro) have guaranteed "exclusive" use of local fishing resources by the Aventureiro people and their relatives (e.g., some fishers from Provetá). Therefore, if territoriality is investigated at the larger scale of the coastal zone of the island, the marine reserve itself may be seen as a fishing territory – the two protected areas provide a *de facto* territory for Aventureiro and some Provetá fishers. This neighboring community has reciprocal rights with Aventureiro and kinship ties to provide social backup to these reciprocal rights.

Conclusions

The Aventureiro fishery shows that a community-based fishery need not depend on overt territorial behavior to hold an exclusive fishing area. The two reserves indirectly help to insure resource access to local people, while at the same time, prevent outsiders (e.g., fishers from outside Aventureiro and Provetá) from fishing in the area. The real test of territoriality would have been an event involving small-scale fishing by outsiders. However, such a test did not occur because of the protection offered by the reserve status of the area.

In conclusion, we stress that territoriality is an incomplete focus in studies regarding common-property resource management as fisheries resources. Reciprocity, information sharing and other local institutions may be more important for organizing the local use of common-property resources. Community-based fisheries management must regard such institutions.

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Table 1. Hook and line fisheries on coastal rocks or on paddle canoes. Fishing grounds visited more than five times for fishers who performed more than three trips: Fisher (total trips per fisher), Trips per fisher in each fishing ground.

Fishers (Trips/fisher)	Fishing Grounds							
	Pedra do Demo	Ponta do Aventureiro	Caial do Varejo	Ilhote	As Tocas	Caial Alto	Other Grounds*	
F3	(25)	8	1	8	1	2	1	4
F33	(19)	14	1	1	1	1	1	
F1	(16)	1	12	1	1		1	
F22	(12)	6	1	1	2	1		1
F25	(12)	5		1		3	1	2
F20	(8)	3		2	2		1	
F4	(8)	1	1	2	3			1
F9	(8)		1	2	1			4
F55	(5)		4	1				
F15	(4)	2			1			1
F19	(4)	1		2	1			
F31	(4)		1	2				1
Fishers diversity per ground		13	19	18	11	10	6	--
Total trips per ground		47	32	30	15	13	6	--

* It includes several fishing grounds visited less than 6 times.

Table 2. Hook and line fisheries on coastal rocks or on paddle canoes. Fishing grounds visited more than five times: Fishers' family, Total trips performed by family's members, Trips per family's members in each fishing ground.

Fishers' Family	Total Trips*	Fishing Grounds (Total Trips)					
		Pedra do Demo (47)	Ponta do Aventureiro (32)	Caial do Varejo (30)	Ilhote (15)	As Tocas (13)	Caial Alto (6)
Family B	25	8	1	8	1	2	1
Family Q	19	14	1	1	1	1	1
Family A	18	1	13	1	1	1	1
Family E	13		5	3	1		
Family H	13	4	3	2	1	2	
Family L	12	6	1	1	2	1	
Family N	12	5		1		3	1
Family C	11	1	2	4	3		
Family J	8	3		2	2		1
Family P	8		3	3	1		
Family F	6	1	3	1		1	
Family I	4	1		2	1		
Family U	4	1		2	1		
Family T	3	2				1	
Family M	2		1			1	
Family R	2		1			1	
Family D	1		1				
Family O	1						1

*It also includes trips to other grounds not listed above

Table 3. Grounds visited at least three times for set gillnet fisheries (both floating and bottom gillnets) on paddle canoes or on small boats: Fishers, total trip per fisher(s), fisher's family.

Grounds (total trips)	Fishers	Trips per fisher	Kinship	Fisher's family
BOTTOM GILLNET* (Corvinheira)				
Praia do Sul (9)	F38, F46	4	Employees	C, P
	F7, F40, F50	2	Uncle/nephew/employee	D, E, P
	F7, F40	1	Uncle/nephew	D, E
	F40, F56	1	Cousins	E, C
	F4, F38	1	Uncle/nephew	C, C
Costão do Aventureiro (6)	F38, F46	3	Employees	C, P
	F7, F40	2	Uncle/nephew	D, E
	F7, F9	1	Brothers	D, E
Fora da Parnaioca (6)	F7, F40, F50	5	Uncle/nephew/employee	C, E, P
	F7, F3	1	Cousins	D, B
FLOATING GILLNET** (Rede de Espera)				
Alagada (18)	F34	8		R
	F23	5		M
	F25	2		N
	F54	1		
	F3	1		B
	F9	1		E
Praia do Sul (4)	F34	2		R
	F23	1		M
	F9	1		E
Praia do Demo (4)	F34	3		R
	F3	1		B

* Floating Gillnet is set on the water surface. It usually has 45 to 60 mm between knots and maximum of 100 m long and 10 m high.

** Bottom Gillnet is set on the bottom of ocean by two anchors. It usually is over 500 m long and maximum of 3 m high.