SAMUDRA Monograph

Artisanal Fisheries in Brazil

Antonio Carlos Diegues

International Collective in Support of Fishworkers
www.icsf.net

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Abbreviations

BNDES	Banco Nacional de Desenvolvimento Economico e Social (National Bank for Social and Economic Development)
CIRM	Inter-ministerial Commission for the Resources of the sea
CNPT	Centro Nacional de Pesquisa de Trigo (National Council of Traditional Populations)
CONAMA	National Commission for the Environment
CONAPACH	Confederación Nacional de Pescadores Artesanales de Chile
DPA	Department of Fisheries and Aquaculture
EEZ	exclusive economic zone
EMBRATUR	Instituto Brasileiro de Turismo (Brazilian Agency for Tourism)
ENGOs	environmental NGOs
FAO	Food and Agriculture Organization of the United Nations
IBAMA	Brazilian Institute for Environment and Renewable Resources
MONAPE	Movimento Nacional de Pescadores
MPAs	marine protected areas
NGOs	non-governmental organizations
NUPAUB	Núcleo de Apoio à Pesquisa Sobre Populações Humanas em Áreas Úmi das Brasileiras
PEP	Professional Education Programme
PESCART	Plano de Assistencia a Pesca Artesanal (Assistance Programme for Artisanal Fishing)
PLANTUR	National Plan for Tourism
PRODETUR	Programme for the Development of Tourism
SEMA	Secretaria Especial do Meio Ambiente (Special Secretariat for the Environment)
SINPESCA	Sindicato da Industria de Pesca dos Estados do Pará e Amapá
SUDEPE	Superintendent for the Bureau for the Development of Fishing
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
WWF	World Wide Fund for Nature

Artisanal Fisheries in Brazil

INTRODUCTION

The interest in artisanal fishing has increased of late, both in governmental as well as academic bodies, for many reasons. Among those worth mentioning are: the little success that the governmental policy for the development of the fisheries sector in Brazil has enjoyed, focusing, as it does, almost exclusively on industrial fisheries; the growing recognition of the importance of artisanal fishworkers who, even without the government's help, continue to supply the local and regional markets with their yield; the innumerable pressures that the artisanal fishworker communities have been suffering of late, owing to the expansion of the interests of the real-estate and tourism sector and environmental degradation, factors which many a time force the artisanal fishermen to move to cities, having lost their land; the coverage given to these conflicts by the press; the recent political liberalization in Brazil, after the fall of the military regime (1964 to 1984), which allowed the exploited and forgotten groups of society to express themselves more freely, especially in defence of their rights and aspirations in the Constituent National Assembly; the work carried out by non-governmental organizations (NGOs), in particular, the Catholic Church, through the activities of the Pastoral da Pesca, mainly in the north and northeastern States, and the birth, in 1989, of the national fishers' organization, Movimento Nacional de Pescadores (MONAPE).

In spite of these new factors, the development of artisanal fisheries still poses a great challenge because of the lack of policies, strategies and concrete experiences that would lead to a sustained development of fish production, the betterment of the living conditions of the fishworker communities, better organization, and so on. On the contrary, there is a continuous worsening of the problems affecting production by the artisanal fisheries sector, owing as much to objective factors (environmental degradation, the endangering and destruction of natural resources, and so on) as to the ineffectiveness of the government's strategies in overcoming the obstacles that impede the sustained development of the artisanal fishworker communities in the Brazilian coast.

The situation has turned much more serious ever since the shifting, after 1989, of policymaking for fisheries from the hands of the Superintendence for Fisheries Development (SUDEPE) to the Brazilian Institute for the Environment (IBAMA). As IBAMA solely concentrates on environmental issues, (environmental legislation, law reinforcement), there is no interest whatsoever in the sustained development of the artisanal fishworker communities. At this juncture, in Brazil, there does not exist any specific plan or policy aimed at the sustainable development of artisanal fishing.

In 1998, the government shifted a large part of the responsibilities of the fisheries sector from IBAMA to the Ministry of Agriculture, constituting the Department of Fisheries and Aquaculture (DPA), leading to duplication of responsibility and thus more confusion in the sector. The new DPA is under the influence of the industrial fisheries sector, and is mainly concerned with the leasing of foreign boats for tuna fishing, ignoring important aspects like the establishment of a new fishing policy.

Besides attempting an analysis of the situation of artisanal fisheries, this study intends to put forth to NGOs and regional and national organizations of artisanal fishworkers, some alternative strategies for the development of the sector.

1. NATURAL ECOSYSTEMS AND THE CULTURAL DIVERSITY OF THE ARTISANAL FISHWORKERS

Artisanal fishing is practised in a variety of ecosystems that greatly influence the way fishing activities are organized. Sea currents, winds, tides, waves, coastal vegetation, fauna and flora, and, particularly, ecological cycles are important elements that are taken into consideration by artisanal fishermen in order to organize their fishing activities.

The Brazilian coast is located between latitude 4°52'45"N and 33°45'10s"S and is approximately 7,408 km long, presenting a variety of coastal and marine ecosystems such as dunes, reefs, bays, estuaries, lagoons, mangroves and cliffs.

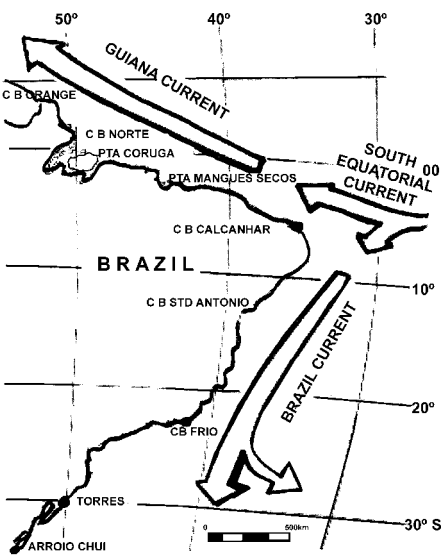

Figure 1

There are coastal plains formed by sand deposition of the Quaternary Period, and mangrove areas in the north and northeast regions, where the tertiary formation reaches the sea. In the southeast, the pre-Cambrian structure of the "Serra do Mar" almost reaches the coastline, creating cliffs and small bays.

Brazil's continental platform is the continuation of the continental mass directed towards the ocean. The width varies, being wider in the north of the country, becoming narrower in the northeast, and wider again in the southeast and southern region.

There are three oceanic systems affecting the Brazilian coast: the Southern Equatorial Current reaches the coast at 5°S going northward. The States of Maranhão, Pará and Amazonas on the northern coast are affected by the Northern Equatorial Current and are also areas with a high tidal range. The Brazilian Current affects most of the Brazilian coastline between 25°S and 5°S. The southern of Brazil's coast is affected by the Malvinas Current, which travels from the southern part of the continent up to 30°S (Figure 1).

Tidal ranges become smaller from north to south, with values up to 7 m in the north (São Luís, Maranhão) to less than 1 m in the south (Imbituba, Santa Catarina). The region includes a diverse range of coastal formations, from the

intertropical realm in the Amazonian region, to the tropical realms in the north and northeast of Brazil, to the temperate marine areas of the south.

The great size of Brazil allows for considerable diversity of coastal exposure and geomorphologic development. There are three principal portions of the shore. The first is the area in the north that is influenced by the Amazon River and its sediments; the second is the narrow coastal margin fringing the huge Brazilian Shield, creating an escarpment nearly adjacent to the ocean; the third is the southern area, where considerable quantities of sediments have accumulated to provide a barrier island formation.

The mouth of the Amazon River is a great estuary stretching for hundreds of kilometres inland. Large quantities of sand and especially silt and clay are discharged by the river and accumulate along the shore margins. From the border with Surinam eastward to the Baía de São Marcos, the fine-grained sediments blanket the shoreline and are cloaked with mangrove. East of the Baía de São Marcos, the shoreline begins to be characterized by sandy beaches lying before low hills. The sand beaches are interspersed with mangrove stands.

Beginning in Rio Grande do Norte and continuing southward to the coastal margin of Alagoas State, the beach zone is severely attenuated. The dry climate and the short drainage systems limit the transport of sediment to the ocean margin. This portion of Brazil is bordered by fairly extensive coral reef formations.

South of Recife, the coast is cliffed. The combination of cliffed coast and the presence of coral reef extend for about 500 km. Sandy beach backed by an escarpment begins near the Alagoas-Sergipe border and continues south to the State of Rio Grande do Sul. The beach often broadens in large curvilinear embayments, and there may be local mangrove stands, beach ridges and deltaic buildout. In the State of Paraná there is an extensive area of beach ridge development. The beach ridges attain elevations of 10 m in their interior location and gradually decrease to elevations of 2-3 m near the shore.

The coastal margin of the State of Rio Grande do Sul is distinct from the rest of Brazil, consisting of a classic barrier island-lagoon sequence. Broad sandy beaches extend along the coast for 640 km and incorporate wide beach ridge systems and large coastal dunes reaching 25 m in elevation. The northern margin of this coastal plain comes against a terrace surface with elevations of 15 m.

1.1 LIFE SUPPORT SYSTEMS ALONG THE COAST

There are a large variety of inshore and coastal ecosystems, in which diverse communities of artisanal fishworkers live and work. Thus, at the southern end of the country, there are artisanal fishermen, who are descendants of the Azorian migrants who developed techniques and systems suited to a jagged coastline, with many islands, bays and lagoons. In the southeastern region are the *caiçaras*, descendants of the Portuguese colonizers, natives and blacks who combine small-scale fishing with agriculture. In the northeast, the raft fishermen (*jangadeiros*) who use a specialized raft adapted to beaches without piers, known as the *jangada*. In the northern end are the *praieros*, fishers who developed a large variety of boats suited especially to a coast with fluctuating tide conditions.

The Brazilian coast presents a variety of ecosystems and habitats. The most relevant are:

Coral Reefs

The distribution of coral reefs in the South Atlantic is limited to tropical areas along the coastline and offshore islands of Brazil. The coral fauna has long been considered of interest on account of its high proportion of endemic species. Some 3,000 km of coast have reefs, although not all of these are true coral reefs. Ten of the 18 hermatypic coral species known from Brazil are endemic.

Two main coral reef formations may be identified on the Brazilian coast. The first is Grupo Recife do Cabo São Roque that unfolds from Cabo de São Roque until Natal in Rio Grande do Norte State, along which are the Fernando de Noronha archipelago and the Rocas atoll. The second is the assemblage of coral reefs situated in the Bahia State's south coast (the Abrolhos archipelago), which is the richest and most developed coral reef formation in the region. In addition to these main formations, coral reefs also occur between Natal and the São Francisco river mouth and on the latitude of Salvador Bahia (both usually associated with calcareous reefs).

The northeast coast formations are rocky calcareous outcroppings forming reefs and hence differ from the coral reef formations such as those of the Abrolhos archipelago. Coral reefs are important habitats where artisanal fishermen work.

Mangroves/Estuaries

These ecosystems extend almost along the entire coast of Brazil, from Oiapoque (Amapá) to Laguna (Santa Catarina), occupying an area of about 25,000 sq km. The northern limit of mangroves on the American continent is found in Florida (US), and extends to Santa Catarina State in southern Brazil. The most extensive areas of mangrove are associated with the mouth of the Amazon River in the north of Brazil, and well-developed communities extend from the northern boundary of the region to the State of Piauí. Less extensive areas of mangrove are present along the coast until saltmarshes become dominant in the States of Santa Catarina and Rio Grande do Sul. Low stands of *Avicennia schaueriana* and *Rhizophora mangle* terminate at Florianópolis (27'3O'S), but *Laguncularia racemosa* extends southward to the poleward limit of mangrove at the mouth of the Araranguá River (290S) (Figure 2).

Figure 2: Mangroves Along the Brazilian Coast

The main areas of higher productivity are the estuarine and coastal habitats, which receive larger amounts of nutrients from continental runoff. These ecosystems and habitats present a large variety of flora and fauna that sustain a variety of economic activities. Birds, fish, crustacea, molluscs, mammals are abundant in these habitats and some of them are already endangered, including (along Belém coast) *Eudocimus ruber* (*guará*), *Phoenicopterus ruber* (flamingo), *Trichechus inungis* (Amazonian manatee), *Procyon cancrivorous (*crab-eating racoon*)* and *Dermochelys coriacea* (trunk turtle); (along the Amapá coast) *Dendrocygna autnmnalis (marreca)* and *Chelonia mydas (*green turtle); (Maranhão coast) *Harpia harpya* (harpy eagle), *Aratinga garoupa* (golden paroquet), *Porphyrula martinica* (rail), *Alouatta fusca* (howling monkey) and *Tricherus Manatus* (manatee); (on Mucuri estuary) *Falco peregrinus* (Peregrine falcon) and *Ara*

ararauna (Canindé macaw); (on Linhares grassy marshers) *Crypturellus noctivagus* (zaeble red-footed tinamou), *Myrmecophagus tridactyla* (great anteater), *Lutra enudris* (otter) and *Dermocheluys coriacea* (trunk turtle); (on Iguape-Paranaguá estuary) *Bubo virginianus* (jacurutu), *Cebus apella* (macaco-prego) and *Tapirus terrestris* (lowland tapirs).

Some fish species are being severely overfished, in particular, shrimps (*Penaeus schmitti, brasiliensis, paulensis, Panulirus argus*) and *P. laevicauda* (lobsters), *Bachyplatytoma vaillati* (*piramutaba*), *Sardinella brasiliensis* (sardines) and several species of mangrove crabs.

Although these ecosystems are protected by law, they are threatened by urbanization projects and, more recently, by the construction of ponds for shrimp cultivation, particularly in the northeast.

Coastal lagoons

Coastal lagoons are bodies of water separated from the ocean by sandbars. Tropical lagoons can have varying degrees of salinity due to rainfall. They have an elongated shape, generally narrow along their principal axis, which is parallel to the coast. Sandbars (*restingas*), reefs and raised terraces formed by fluvial and marine sediment accumulation as well as beaches, contribute to the formation of lagoons. Examples are Feia, Araruama, Saquarema, Maricá, Sepetiba (in the State of Rio de Janeiro), Roteiro, Jequiá, (in Alagoas), and Mirim and Tramandaí (in Rio Grande do Sul). Dos Patos lagoon in southern Brazil is one of the most important centre for artisanal fisheries in Brazil.

Barrier Islands

Barrier islands are stretches of sand deposited in parallel to the coast and created by the dynamic of ocean waters. These deposits occur when the coast forms a headland or cape, which often borders a series of small lakes. They are common in the southern coastline of the State of Bahia and Rio Grande do Sul. The main Brazilian *restingas* are Ilha Comprida (São Paulo) and Marambaia. (Rio de Janeiro).

Other Coastal Wetlands and Saltmarsh

In Brazil, tidal marshes occur as a pioneer community and as a secondary formation in disturbed areas within mangrove woods along the coast. Tidal marshes become prevalent on the southern coast of Santa Catarina and Rio Grande do Sul, where extensive saltmarsh formations are found, the most

important being associated with the Patos, Mirim and Mangueira lagoons in Rio Grande do Sul. Saltmarshes are found in the following locations in Brazil: the bays of Paranaguá and Guaratuba (Paraná), the Lagoa de Conceição (Santa Catarina) and principally, the coastal lakes in the southern region such as the Patos, Peixes, Mirim and Mangueira lakes.

Tidal flats

Tidal flats are low littoral coastal areas that are covered by the tides and are of great ecological importance. Examples are Marituba (Alagoas) and Marajó (Pará).

Beaches, Dunes, Cliffs

The best-developed beaches and dunes are found on the coast of Brazil. In the north, much of the shoreline is formed by sandy beaches interspersed with mangroves lying before low hills. Sandy beaches continue from Alagoas State to the south, where large dunes and barrier island formations occur.

Islands and Submerged Banks

The Brazilian coast has a variety of large islands such as Marajó, at the mouth of the Amazon; São Luís, in Maranhão; Ilha Bela and Ilha do Cardoso, in São Paulo; Ilha Grande, in Rio de Janeiro; and Santa Catarina, in the State of Santa Catarina. There are also some oceanic islands and archipelagos.

Atol das Rocas lies about 200 km northeast of the coast of Rio Grande do Norte State. The atoll is an almost circular reef possibly lying on the same submarine shelf (the platform of the Rio Grande do Norte) as Fernando de Noronha. This is a volcanic archipelago consisting of a principal island of 17 sq km and 18 islets of varying sizes. The archipelago lies 350 km northeast of Cabo de São Roque and has a similar flora and fauna to the Atol das Rocas. The islands of São Pedro and São Paulo (St. Paul's Rocks) are situated in the Atlantic about 500 km northeast of Fernando de Noronha.

Sand Barriers (*Restingas*)

Restingas are found along the Brazilian coast in Marambaia (Rio de Janeiro), Ilha do Cardoso and Ilha Comprida (São Paulo), Guarapari (Espírito Santo) and São José do Norte (Rio Grande do Sul).

Coastal ecosystems are utilized by artisanal fishers. *Jangadas*, a type of raft, are used in the northeast, and the fishermen in the south-southeast use small

boats of about 8 m length, with an inboard motor, many times used in the trawling of the *sete-barbas*, a variety of shrimp (*xiphopenaeus kroyeri*).

Open Ocean, Deep Sea, Upwellings

On the Brazilian coast, areas of upwelling are rare due to the stratification of the water mass that prevents the surface layers from receiving nutrients from bottom layers. The main exceptions are areas of upwelling in the Cabo Frio region (near Rio de Janeiro). These ecosystems are used particularly by the industrial fleet fishing for tuna and related species.

1.2 DEGRADATION OF THE COASTAL ECOSYSTEMS AND ITS IMPACT ON ARTISANAL FISHING

While the traditional use of the coastal ecosystems, as in artisanal fishing, has little effect on the natural resources, the more recent utilization of these ecosystems has intensified the degradation of these environments considerably, generally in places where there is urban-industrial activity. The artisanal fishers use almost all these ecosystems, and their contamination has been of grave consequence to the productivity of the sector and the quality of life of the coastal communities.

Along the coast, the most important ecosystem is the Atlantic Forest that, at the beginning of the Portuguese settlement, covered around 1,000 sq km. In many parts of the country, this forest reaches the coastline, and, in this sense, mangroves can be considered part of this large forest. The Mata Atlântica (Atlantic Forest) has a biological diversity as high as that of the Amazon Forest, with a large number of endemic species. From the 1960s onwards, when the urban-industrial development was accelerated, this forest was even more intensively destroyed, and today only around 5 to 10 per cent of this large forested biome still exists, mainly along coast of southern Rio de Janeiro, São Paulo and Paraná States. The Mata Atlântica is also home to different human cultures, such as Indians and their descendants, the *caiçaras* and the *jangadeiros* (raft fishermen) who have developed a deep knowledge and traditional management systems of the forest and their adjacent coastal ecosystems.

During the colonial period, the coastal zones where used as trade centres and as the gateway to the conquest of the hinterland, where the mineral and agricultural resources were abundant. Major cities were usually located on the coastline, thus ensuring communication with the colonial power overseas as

well as the hinterland. Marine resources, with the exception of whales, were also exploited at the subsistence level. During that period, boat construction was one of the few important industries on shore and was responsible for intensive woodcutting in some northeastern provinces.

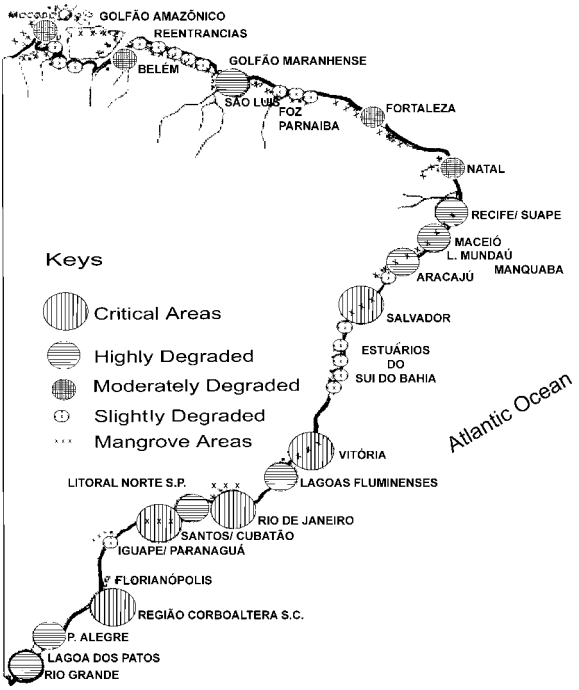

Figure 3: Levels of Degradation of Estuarine Ecosystems in Brazil

After Independence, and particularly during the second half of the 19th century, most of the important economic activities, such as coffee, rubber and sugarcane plantations, shifted from the coastal zone to the hinterland. At the beginning of the 20th century, industrialization led to the production of goods for the internal market to replace imported products. Small industrial plants to process cotton and food products were concentrated both in the hinterland and on the coast.

After the 1950s, Brazil pursued an **industrial economic model**, oriented towards export. Most of the heavy industries (chemical, petrochemical, fertilizers) were, and still are, located in estuaries and bays and next to other fragile coastal ecosystems. Such large industrial centres were located in areas as in São Luís Island (for alumna processing) in the northern State of Maranhão, in the coastal lagoons of Maceió, (Alagoas), in Salvador Bay, in the Vitória Island (for iron export), Rio de Janeiro bay, Santos-Cubatão, in São Paulo, and in the southern lagoon Dos Patos. Huge harbours for export of mining production were established in São Luís (Vale do Rio Doce Cia, Maranhão and Vitória, Espírito Santo). Examples of the large industries settled on the coast are: chemical industries in Arraial do Cabo (Rio de Janeiro), in Aratu and Camaçari in Salvador (Bahia); oil and chemical industries in Cubatão (São Paulo); Dow Chemical, Petrobrás and Petroflex in Rio de Janeiro; Salgema in Maceió (Alagoas); fertilizers in many cities around the coast; coal mining

near the coast of Santa Catarina and Rio Grande do Sul; iron production in Cosipa in Cubatão, CST and Cia de Ferro e Aço in Vitória; paper pulp production, involving large areas of eucalyptus plantations, is important along the coast of Espírito Santo and southern Bahia (Aracruz Papel e Celulose). Many alcohol distilleries have been established along the coast, particularly in the northeast.

As a result, pollution has been heavily concentrated in this zone and coastal degradation has been extensive (Figure 3).

Increasing urbanization is a crucial process that affects the coastal area, as five of the nine metropolitan areas in Brazil are located on the coast. In 1990 Rio de Janeiro had a population of 9.6 mn; Recife, 2.5 mn; Salvador, 2.4 mn; Fortaleza, 2.2 mn. In addition, many capitals of States are also on the coast: São Luís (population: 655,000), Natal (606,000); Maceió (626,000); Vitória (523,000); João Pessoa (695,000); Florianópolis (254,000).[1]

Many of these coastal cities have a high demographic growth, attracting migrants from the hinterland, and a high percentage of these migrants live in *favelas* (slum areas) in Salvador, Fortaleza and Rio de Janeiro.

At the same time, coastal cities are expanding as poor people migrate from the countryside, where the modernization of Brazilian agriculture has led to an increasing concentration of productive land in the hands of a few landowners and groups, both national and multinational. With the expulsion of small landowners and peasants from the countryside, slum areas have been established in large coastal cities. Most sewage systems are inadequate, resulting in increasing pollution of coastal rivers, estuaries, lagoons and bays.

As **road transportation** has the highest priority in Brazil, many highways have been built along the coast. One clear example is the BR-101 built in the 1970s, which links many coastal capitals. During the construction process, many beaches and mangrove areas have been damaged, as has occurred between Santos and Rio de Janeiro. These coastal roads have also encouraged the construction of villas by tourists, and causing also the displacement of many small-scale fishing villages inland and to the mangrove areas, resulting in the destruction of the Atlantic Forest.

Oil drilling is an important economic activity along the Brazilian coast, and oil production started in 1973. The main drilling along the coast are Campos (Rio de Janeiro), Sergipe, Piauí, Rio Grande do Norte, Amazon basin and Recôncavo Baiano. Over 56 per cent of the oil produced in Brazil comes from marine basins. There are important harbours where oil is brought ashore,

the most important of which is situated in São Sebastião, where many accidents occur regularly. Tourism, fisheries as well as mangroves and other coastal habitats suffer from frequent oil spills in the area. Coal is also produced in the coastal area of Santa Catarina and Rio Grande do Sul. Reefs are also exploited mainly in the northeastern coast for construction.

The **tourism and recreation** industry became one of the most important factors influencing the use of coastal areas and resources. Around 1.6 mn foreign tourists visit the country, in particular the coastal tourist resorts, generating an income of US$1.55 bn and around 1.4 mn jobs.

In 1992, EMBRATUR (the Brazilian Agency for Tourism) established the Plantur (National Plan for Tourism), which created several tourism development poles in the coastal areas. In 1991, SUDENE (Agency for the Development of the Northeast) and EMBRATUR created PRODETUR (Programme for the Development of Tourism) and requested a US$1.6 bn loan from the InterAmerican Development Bank. This large programme is directed to the northeastern coast, involving the construction of large hotels, roads, airports and urban infrastructure, such as water and sewage facilities. This programme follows the intensive use of the coastline that exists today in Cancun, Mexico. The ecological and social impacts of this programme have not yet been properly assessed, and social and environmental groups of the area are reacting against it, since local communities and the environment will suffer the most.

Fisheries are also an important source of economic activity along the coastal and marine environments. In addition to the increasing degradation of inshore and coastal environments, overfishing undertaken usually by industrial boats is also occurring, particularly affecting fish species such as shrimps, lobsters, catfish (*piramutaba*), and sardines, among others.

Aquaculture is a fast-growing activity along the north and northeastern coast, affecting several inshore ecosystems such as mangroves, sand barriers and lagoons. The highest impact comes from shrimp cultivation, which has recently started in the States of Ceará, Rio Grande do Norte, Paraíba, Maranhão and Pernambuco, resulting in massive destruction of mangroves and associated ecosystems. Large-scale shrimp cultivation is also affecting the livelihoods of artisanal fishermen as they are loosing their traditional fishing areas.

2. FISHERIES IN BRAZIL

2.1 A BRIEF HISTORY

Fishing and mollusc harvesting were important activities for indigenous people before the arrival of the Portuguese colonizers in the 16th century. In several areas of the coast there are mounds of oyster shells (*sambaquis*) showing that for several centuries, indigenous people fed on molluscs and fish. Jean de Léry, a French Calvinist who visited Brazil in early 1500 has described fishing techniques used by coastal Indians such as bone hooks, and small nets made of fibres found in the forests as well as canoes and *jangadas*, rafts made of floating logs. Fishing was also important along the Amazonian rivers, and Indians used fish as the basic source of protein.

Whaling was the main commercial fishing activity undertaken by the Portuguese since the beginning of their colonization and for several decades was a monopoly of the State. Until the end of slavery in 1888, fishing activities in the northeast were undertaken mainly by African slaves, and fish production was used to feed labourers in the large farms and towns. Along the coast, independent producers also used part of their time for fishing and fish-like mullet was a basis for protein consumption in coastal towns and villages. The social upper classes however used to import salted cod from Portugal (Silva, J.G. 1997).

Two types of relations with the sea developed. In the provinces of São Paulo and Rio de Janeiro, small farmer-fishermen combine fishing with agricultural activities. In the northeast, coastal communities have developed a long tradition of coastal fishing, separated from agriculture. One explanation for this difference, in addition to cultural factors, relies on the fact that the continental shelf is narrower in the northeast than in the south, and that most of the fish species live in rocky habitats further from the coast, requiring better navigational and fishing knowledge on the part of the fishermen. The sandy coast of that area also inhibited intensive agricultural activities. In this connection, one could conclude that artisanal fishermen in the northeast have a strong tradition in dealing with the open sea. Recent studies have analyzed the question of tradition within the framework of the field of maritime anthropology. Most of the fishing was done within the system of the petty mode of production, where part of the fish caught was used for subsistence and part as commodity.

Legislation regarding coastal land has contributed to (but also interfered negatively with) the development of traditional sea tenure. Since the middle of the last century, a stretch of 33 m of land measured from the 1833 highest tide belongs to the State (called Terras de Marinha). This area cannot be privately owned and no permanent construction can be made in that area without State permission. Small-scale fishermen, although having no legal title, occupy these areas. In this sense, they have customary rights of occupancy (*posse*) to live in those areas, where they build their thatched roof houses. The same right (*posse*) is transferred to the nearby coastal waters when they occupy a place in the estuaries and lagoons to build their fixed traps (*cercos*).

The State, through the Navy, also tried to control the artisanal fishermen through forced service. As a result, some fishermen's rebellions occurred in 1903 in Rio de Janeiro and Ceará. To control these rebellions, the Brazilian Navy created in 1921 the first fishermen guilds. According to the guild regulations, all fishermen should be registered in order to get permission to fish. In practice, each coastal municipality has its own guild that regulates the lives of the fishermen. According to the new 1988 Constitution, however, fishermen can organize their own free associations.

Commercial fishing was developed more intensively since the beginning of the 20th century, particularly in the southern States, where the Portuguese and Spanish migrants started to use larger boats for sardine fishing, used also for canning. Industrial fishing was developed more intensively after the 1960s with the support of a large fisheries development programme undertaken by SUDEPE. By that time, however, most of the fishing was done by artisanal fishermen along the coast and rivers.

2.2 FISHERIES PRODUCTION

The Food and Agriculture Organization of the United Nations (FAO) has calculated the sustainable potential for capture as 1.4-1.8 mn tonnes. The national yield has stabilized at 600-700 tonnes in the decade of the 1990s (after a rapid growth between 1960 and 1975).

Table 1: Total Yield of Fish/Year: Marine Fishing and Freshwater Fishing, 1960-1999

Year	Fresh water Fishing (tonnes)	Per cent	Marine Fishing (tonnes)	Per cent	Aquaculture				Total
					Brackish		Freshwater		
						%		%	
1960									281.512
1970									526.292
1988	205,175	24.7	624,927	75.3					830,102
1990	219,487	32.0	435,418	68.0					640,295
1992	200,491	29.9	469,842	70.1					670,333
1994	203,589	29.9	479,662	68.4					701,251
1996	210,277	30.33	422,173	60.9	8,490	1.2	52,231	7.5	693,172
1997	178,871	24.4	465,560	63.5	10,180	1.3	77,478	10.5	732,089
1999	185,471	18.5	418,470	56.2	26.513	3.5	114.425	15.3	744.597

Sources: Brazilian Statistical Institute and IBAMA

The total marine fish catches in 1960 was just over 281,000 tonnes and in 1970, during the first years of the government's fisheries development plan, there was an increase of 100 per cent, reaching the total catch of 526,292 tonnes.

In the last decade, total catches averaged 700,000 tonnes, of which 450,000 tonnes were of marine catches. There was also an increase in aquaculture, in particular freshwater fish cultivation, especially in the rural areas in the south and southeast (Table 1).

According to Dias Neto (1999), the situation of fishing of the major marine species in the 1990s, undertaken particularly by industrial fishing, is as follows: Sardine *(Sardinella brasiliensis*) is, historically, the main fish resource as far as total yield is concerned and is harvested along the southeastern coast. The production system is based on family business and large companies, and fishing is undertaken with the use of the encircling net. The fish stock has decreased dramatically in the 1990s, probably due to overfishing and climatic change. Several canning industries closed down as a result of this situation. Sardine fishing has shown some recovery by the end of the 1990s, but the resource situation is still considered to be critical. Most of the production is targeted at the internal market and is consumed by low-income people. There are several regulatory measures such as minimum size of capture, suspension of fishing

during the reproductive phase of fish, and prohibition of the entry of new sardine fishing boats.

Lobster (*Panulirus argus* and *P.laevicauda*) is an important export-oriented species harvested in the northeast by artisanal fishermen and fishing firms using traps and nets. The yield has been decreasing in the last years, and minimum size of capture is used as a regulatory measure.

Catfish *(piramutaba, Brachyplatistoma vaillalnti)* is a valuable species harvested in the Amazon by artisanal and industrial fishermen, using trawling and longlines. The main problem is overfishing, and trawling is prohibited in certain areas. Today the harvest is directed at the domestic market.

Pink shrimp *(camarão rosa, Penaeus brasiliensis and P. paulensis)* is harvested in the southeastern region, from Rio de Janeiro to Rio Grande do Sul, and targeted at both the foreign and domestic markets. The fishing is done mainly by industrial boats, although this shrimp species is also caught by artisanal fishermen. The situation of the stock is considered to be critical due to overfishing. The main regulatory measures are minimum size and closed seasons.

Sete barbas shrimp (*Xiphopenaeus kroyeri*) is also harvested in the southeastern region. Artisanal fishermen harvest this species using small trawlers. Production is targeted at the domestic market, and the resource is highly exploited. Regulatory measures are controls on the size of the net and the number of boats.

Demersal fishes like *Micropogonia furnieri, Macrodom ancylodon* and *Cynoscion estriatus, corbin or weak fish)* are harvested in the southeastern region and production is entirely directed to the domestic market. These species are caught by artisanal fishermen as well as by industrial fishermen. There has been a certain decrease of the stock due mainly to overfishing by the industrial fleet.

Tuna *(Katuwonus pelamis, Thunus obesus, T. alalunga, T albacares, Xiphias gladius, Coryphaeuna hippurus, Scomberomus cavalla* and *S. brasiliensis)* are harvested in the open sea and in the exclusive economic zone (EEZ). Tuna fishing is done exclusively by the industrial fleet and is directed at the export market. There is still some potential for catch increases.

It is important to note that IBAMA exercises a certain control on the species harvested by the industrial fishing firms, but there is little information on the situation of the resources captured exclusively by artisanal fishermen, mainly in estuaries, lagoons, beaches and rivers.

Overexploitation is a result of the growing demand for species such as shrimp and lobsters, acquired by the intermediaries beyond the quantities permitted by the law. To our understanding, it seems that overfishing, encouraged by the opportunistic middlemen, is not solely responsible for the lowering of the productivity; there are also other factors such as urban-industrial pollution and environmental degradation that are equally important causes.

In principle, the possibility of the expansion of the fishing of certain demersal and pelagic species exists (like weak fish, corbines, tuna and lane snapper), but there are signs of overfishing, mainly in the most important fish resources such as sardines, shrimp, lobsters and catfish.

Besides the capturing of fish, there is also great potential, not yet exploited, in mariculture, above all of mussels, oysters and prawn. The molluscs (crabs, large oysters and mussels) are extracted artisanally in all the regions in the country, when fish capturing is small, and the collection of mussels and shellfish is done by women and children, supplying the poorest with their daily nutrition.

There is also a tradition of extensive cultivation of fishes and crustaceans in the brush parks, ponds and tanks constructed by small fishers. The extensive cultivation in ponds in the northeast represents an important part of the diet of the rural population.

Intensive aquaculture, nevertheless, is carried out by companies and is in a state of heavy expansion in Brazil, especially in the northeast, where there is a great threat to the mangroves, a legally protected ecosystem, and to the way of life of the artisanal fishers.

The freshwater prawn (*M. rosenbergii*) was introduced in the 1970s and is the most important species in commercial cultivation in the Brazilian coast. This activity is in its infancy but is growing rapidly. There are also plans to expand culturing of marine prawn (*Penaeus schmitii*, *P. paulensis* and *P. japonicus*). This could pose a grave threat to the mangroves, which are ecosystems totally protected by the law, and to the artisanal fishers who work in these ecosystems. The production of shrimps in ponds grew from 2,385 tonnes in 1994 to 15,000 tonnes in 1999, utilizing an area of 5,000 ha. In 2000, the total shrimp culture reached 25,000 tonnes, mainly for export, occupying around 7.000 ha. Aquaculture has increased its proportion of funding, from US$120,000 in 1990 to US$13,028 in 1996, as loans taken from BNDES, the National Bank for Social and Economic Development (Martins, 2002).

3. FISH MARKETING AND PROCESSING

Most of the frozen fish traded in large city supermarkets come from industrial fishing industries and imports. Artisanal production is generally traded in coastal towns and regional centres. Most of the crabs, mussels, oysters and other shells are produced by artisanal fishermen, and the commercialization is done, sometimes, through co-operatives. In Santa Catarina, many small-scale fishermen are becoming oyster cultivators, partly due to the decrease in fish stocks. Mussels are also being cultivated by small-scale fishermen in the northern coast of São Paulo. Fish from rivers and lakes as well as from sport fishing is increasingly important as a source of protein in urban centres.

3.1 THE MARKET

Brazil has a population of around 170 mn people who consume around 6.4 kg of fish per person per year, lower than the international average, which, in 1990, was around 13.5 kg/person/year. A large part of the catch (70 per cent) is for consumption, and 30 per cent for the production of fish oils and fishmeal.

Until 1998, the country used to export more fish than it imported, but this trend was reversed and today imports are rising considerably. The main products exported are shrimp, lobster, lane snapper and catfish to the US, the European Union and the countries in Mercosul. Paraíba State is becoming an important harbour for tuna export, having exported 10,000 tonnes to US and Europe in 2000.

The imports come mainly from Argentina (hake), Chile (salmon) and Norway, Portugal and Canada (cod). In 1995 Brazil imported 206,362 tonnes of fish and in 1997, 190,105 tonnes, the equivalent of one-third of the total national capture (BNDES,1996).

Most of the fish export is done by fishing industries located in the Santa Catarina, Rio de Janeiro, São Paulo, Ceará and Pará States. However, part of the lobster and shrimp exported is caught by artisanal fishermen and sold to local industries for export.

The network of fish trade in artisanal fishing villages is complex, often involving middlemen at several levels, from the beach to the neighbouring cities and central markets in State capitals. In the Amazonian region, for instance, artisanal fishworkers, especially those who live far from the cities, are totally dependent on the middlemen who enjoy a monopoly. In Pará the fish bought by the *geleiro* is resold to the 'weigher' who, in turn, sells it to the 'retailer' and to the 'retail

market'. In the 1970s, due to the widening of the roadways network, the traders in the cities as well as the fishing companies used to send their trucks to the beaches to purchase fish from artisanal fishermen. The fishing companies pay for the fuel of the motorized artisanal boats in exchange for the monopoly given to them in the purchase of the catch.

3.2 THE PROCESSING INDUSTRY

According to the Ministry of Agriculture, in 1995 there were around 277 fish storage and processing units in the country, as compared to the 338 that existed ten years ago. This meant a decrease by 18 per cent of industrial units, between 1985 and 1986. The sardine sector suffered a significant loss in that decade, caused by the drastic reduction in the catches of sardine (Table2).

At present (1995) these units are distributed State-wise as follows:

Table 2: Industrial Units in the Major States

State	Number	Per cent
Santa Catarina	55	19.9
São Paulo	49	17.7
Rio Grande do Sul	27	9.7
Rio de Janeiro	26	9.4
Pará	24	8.7
Ceará	19	6.9
Others	77	27.7

Source: BNDES, 1996

The centres that are historically important for the fish-processing industry are Rio de Janeiro and the southern region of the country, mainly Santa Catarina and Rio Grande do Sul. The industry in Rio Grande is mainly constituted by plants established since the beginning of the 20th century, when industrial fish harvesting was introduced by Portuguese fishermen. When many of the subsidized firms went bankrupt in the 1980s and 1990s, due to overfishing and poor administration, and when the subsidies were subsequently cut, multinational firms such as Quaker and Unilever bought up Brazilian firms.

Funding for industrial fisheries development ceased when SUDEPE was extinguished in 1988 and was resumed on a smaller scale by BNDES, the National Bank for Social and Economic Development that, in 1996 released US$3,106,000 for fish-processing industries and less than US$100,000 for fishing firms.

The plants in the north of the country, particularly in Pará, are more recent and have resulted, partly, from the relocation of the plants in the southern States of the country, whose fishing companies overexploited the main species of fish and shrimps in the southeastern region in the 1970s and 1980s and subsequently relocated to the Amazonian region where the reserves were relatively unexploited. The plants in Ceará process lobster for exports and buy an important part of the artisanal production.

In fish-processing plants, according to Barbosa, Lima and Maneschy (2000), the division of labour by sex follows a pattern. Men undertake pre-processing tasks — unloading at the port, transporting to the plant unit, and weighing. Both men and women contribute to the initial stages of processing: breaking fish stings and placing the fish on conveyor belts. The work that follows takes place in an air-conditioned hall, where sanitation measures are strictly enforced. Most tasks here are performed by women—de-heading the fish, passing them through the rotatory saw (according to the species and market demand, it might be necessary to take off the skin), slicing the fish with a horizontal blade, de-boning, filleting, washing, packing, weighing and arranging the fish in trays. These trays are then transported to the freezer chambers where men take over.

Recently, D. Silva (1999) has compiled data on 26 women workers of Belém, 16 of whom happened to be working without registration cards, indicating temporary and unstable employment conditions. Subcontracting by companies was a common feature, going by the experience of those interviewed. There is a high turnover of women workers in processing plants–a common feature in this line of work.

Small-scale fish processing is also done at the coastal village level. Traditionally, fish such as mullet and shrimp are salted, dried or smoked for home consumption or for trade in nearby coastal towns. Women's labour is essential in this small-scale processing. In some villages, where electricity is installed, some fishermen are able to buy small freezers in which part of the catch is kept frozen and sold to tourists and restaurants.

4. FISH PRODUCTION SYSTEMS

There are two systems of fish production in Brazil, which are now interdependent: industrial and artisanal. Industrial fishing is defined as fish harvesting undertaken by large boats that belong to a fish company. The social and technical division of labour is marked, and production is sold to processing companies in large markets (wholesale export centres) where industrial fisheries concentrate to market high-value species such as lobster, shrimp and tuna.

Industrial fishing experienced fast growth after 1967, with the fiscal incentive policies introduced by the then recently created SUDEPE. After 1967, various fishing companies were set up, with the main objective of exporting shrimps and lobsters. Many of them did not have any experience in the sector and basically profited from the fiscal incentives. In 1974, 117 industrial units received fiscal incentives, many of them (77 per cent of the total) located in the south-southeastern regions, and responsible for the major part of fish production in Brazil. With the cessation of incentives, many of them disappeared. Others, after having excessively overexploited the south-southeastern regions, moved on to destroy the fish reserves in the rich northern region. Very frequently, industrial fishing boats invade areas that are legally reserved for artisanal fishing.

In the 1970s, there were 204 boats operating, with a total of over 90 tonnes, concentrated mainly in Santa Catarina (45), São Paulo (54) and Pará (34) and mostly belonging to companies that disappeared with the termination of fiscal incentives towards the end of the 1980s. At the beginning of the 1970s, there were around 7,000 fishworkers employed by industrial fisheries and firms, concentrated mainly in the south-southeastern region. As no statistical census has been taken since the disappearance of SUDEPE in 1989, it is very difficult to ascertain how many fishworkers are currently employed by the fishing industries in Brazil. Nevertheless, it would appear to be a much smaller number than in the 1970s.

Today many fish companies in north and northeastern Brazil are located in Belém, Pará, and there are others in Fortaleza (Ceará) and Recife (Pernambuco), and in the State of Amapá. IBAMA, the Brazilian environmental body that controls and regulates fishing activities, has issued prawn fishing licences for 250 vessels and *piramutaba* licences for 48 vessels in the northern coast of Brazil (Maneschy, 2000).

In 1999 around 43 fishing companies of the region were associated with SINPESCA, the union of fishing industries, 40 in Pará and three in Amapá.

Most of the companies are located in Belém (35), employing an average of 4,000 people. Of late, though, this number has reduced considerably. In 1999, hardly 2,800 people were employed in this sector, around 1,500 in fishing and 1,300 in post-harvesting activities, including women who worked in processing.

According to Maneschy (2000), the prawn season in the northern region is from February to November. Steel vessels, each 22-m long with a 375-hp engine, a gross weight of 100 tonnes and a refrigeration system on board, are employed. The crew comprises five men, and the journey lasts 45 days. Each ship has two trawl nets (double rigs). The prawns are shelled on board, washed, brined and stored in the refrigerated chambers. On land, they are washed again, classified according to size and packed for refreezing until the time for export. According to SINPESCA, the catch, which in 1998 was over 2000 tonnes, is primarily exported to Japan (50 per cent) and the US (30 per cent), while 20 per cent is sold to the domestic market.

The same types of boats are employed for catching fish, though they lack refrigeration facilities on board. The trips last 15 days. Some 48 boats hold licences to operate along the northern coasts, though SINPESCA admits that some boats operate illegaly. At present, 60 per cent of the fish production is sold in the internal market, and 40 per cent is exported to the US, mainly of catfish (*piramutaba* and *dourada*). Around 600 tonnes of fish were exported in 1998–a drastic fall from 1993, when more than 2,000 tonnes were exported (Maneschy, 2000).

The artisanal fisheries sector has a long-standing tradition in Brazil and, at the time of the establishment of fiscal incentives, represented more than 80 per cent of the fish production of the country. Artisanal fishing is practised in the coastal ecosystems (lagoons, estuaries and the continental platform) by a number of fishworker communities settled along the coast and in small coastal towns.

Table 3: Lists the Main Species Captured by Means of Artisanal and Industrial Fishing in the Four Coastal Regions of Brazil

Region	Artisanal	Coastal Industrial	Oceanic Industrial
North	*dorada*, *corbina*, *gurijuba,* crab*, piramutaba* catfish	shrimp, *piramutaba* catfishlane snapper	lane snapper
Northeast	mackerel, *sierra*, lane snapper, dogfish, lobster, shellfish, crab	lane snapper, lobster	albacore, *bonito*
South/ Southeast	dogfish, corbine, weak fish, plain fish, shrimp, shellfish	sardines, corbine, weak fish, shrimp	albacore, *bonito*, dogfish

For the purpose of this article, the following classification of regions has been used:
North: The States of Pará and Amapá
Northeast: Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia
Southeast: Espírito Santo, Rio de Janeiro, São Paulo
South: Paraná, Santa Catarina, Rio Grande do Sul

There is a continuing debate on the definition of the term 'artisanal fishing'. The criteria adopted by SUDEPE to classify the sector is to consider boats with less than 20 tonne capacity, which is clearly unsatisfactory, as some industrial fishing boats also fall into this category. As a result, statistics on the production in the sector are not accurate.

In this study, a marine artisanal fisherman is defined as an independent fish harvester whose livelihood is based on fishing, on a part- or full-time basis, using labour and knowledge-intensive fishing techniques, employing family community labour on a share basis for harvesting in coastal habitats. The fish catch is usually sold in the market, usually through middlemen, although part of the production is directed for household consumption.

Although the issue of traditional knowledge and management will be discussed later, it is important to emphasize that tradition, knowledge and profession are at the core of the definition of an artisanal fisherman. A profession is understood as a possession of knowledge or a set of skills, practices and techniques responsible for the perpetuation of fishing as a livelihood. In this sense, making a livelihood from the sea, rather from the land, is a basic feature of the communities of maritime artisanal fishermen. The unique character of maritime communities is linked to the physical environment, which suffers marked seasonal changes and is affected by atmospheric conditions, leading to rapid transformations in the marine conditions (thunderstorms, hurricanes, seaquakes), which, in turn, pose constant danger to those working there.

Renewable natural resources in the open sea, especially the several species of fish, are mobile and often not visible, migrating from one environment to another and reproducing themselves according to complex patterns.

Artisanal fishermen, in the process of symbolically representing the sea and its living resources, developed different kinds of social, economic and cultural practices for using and coexisting with their maritime environment. These social and cultural practices give a cultural dimension to the maritime environment.

The control over the art of fishing is learned both with the elders and through experience. With the elders, a fisher also learns the symbolic representation of the natural world expressed as the 'respect' for the laws that govern the sea, its resources and the whole community life. This knowledge is located in the figure of the boat captain who holds the secrets of the sea and the traditional techniques for locating schools of fish.

Traditional artisanal fishing communities, however, should not be considered as being unchanging or having no history. Several authors in Brazil (Forman, 1970; Mourão, 1971; Diegues, l983; Cordell, 2000) have already shown that various technological changes (nylon nets, engines, etc.) were adopted by artisanal fishermen's communities without inducing radical transformation in the relations of productions. In some cases, however, there has been a transformation (partial or complete) of fishermen-peasants into full-time maritime fishermen, who are still integrated into the petty mode of production.

In the fishing of sardines, for example, where large seine-boats and nets belong to the fishing industry, some artisanal fishermen were incorporated into the crews of capitalist fishing boats within a new form of production (Duarte, 1973). The transformation of independent artisanal fishermen in crew members of a large industrial boat, however, is conflictive and, in most cases, transient, as artisanal fishermen frequently return to their autonomous familiar way of fishing.

Although artisanal fishermen's communities share social characteristics along the Brazilian coast, the definition of artisanal fishermen should take into consideration specific regional cultural and ecological features.

The importance of artisanal fishing in Brazil is due to (a) the volume and value of the catches; (b) the number of persons employed in the capture, processing and marketing of the product; and (c) the economic, social and cultural functioning of the fishworker communities spread out in the coastal areas.

Table 4: Maritime Industrial and Artisanal Fish Production

Year	Total Production (tonnes)	Industrial Fishing (tonnes)	Per cent	Artisanal Fishing (tonnes)	Per cent
1960	276,000	36,000	16.4	240,000	83.6
1970	478,000	198,000	46.4	280,000	53.4
1980	635,968	392,325	61.6	243,643	38.4
2002	535.403	149.603	47.5	281.329	52.5

Source: IBGE and IBAMA

Past statistics show that artisanal fishing was predominant in the 1960s, before the introduction of the government's policy of support to industrial fishing. The proportion of artisanal fishing in relation to industrial fishing decreased towards the end of the 1970s and the 1980s. In 2002 it once again exceeded industrial fishing. To what do we owe the increase in artisanal fishing in the past years? Without doubt, to the fact that the fishing firms, after exploiting areas traditionally used by artisanal fishworkers, withdrew from them, as they ceased to be profitable, and abandoned them to artisanal fishing. On the other hand, artisanal fishing has increased in rivers and dams.

It is necessary to clarify that, in regard to maritime fishing, an important part of the production attributed to industrial fishing companies is, in fact, artisanal, as the product from artisanal fishing is sold to industries and industrial fleets.

On an average, artisanal fishing is responsible for more than 50 per cent of the total value of the capture, exceeding industrial fish production in some regions (north and northeast). This indicates that artisanal fishing concentrates mainly on the exploitation of species of higher market value.

Table 5: Contribution of Artisanal and Industrial Catches Regionwise (1980-1995)

Regions	Years	Industrial Production (tonnes)	Per cent	Artisanal Production (tonnes)	Per cent	Total (tonnes)
North	1980	4,332	11.5	34,578	88.0	38,910
	2002	27,315	16.7	136,588	83.3	63,903
Northeast	1980	21,837	18.0	99,027	82.0	120,864
	2002	13,269	12.0	97,240	88.0	110,509
Southeast	1980	202,237	79.3	52,707	20.7	254,944
	2000	63,887	65.7	33,401	34.3	97,288
South	1980	163,929	74.1	57,331	25.9	221,260
	2002	149,603	91.4	14,101	8.6	163,704

Source: IBGE/IBAMA

Firstly, a significant decrease (around 50 per cent) in the total catch is to be noted between 1980 and 2002, in the south and southeastern regions, traditionally the most important fishing areas in the country. This reduction is explained, to a large extent, by the decrease in sardine fishing. At the same time, there is a minor increase in the total capture in the northern and northeastern regions. In these regions there is an increase in artisanal fishing, compared to industrial fishing. In the case of the northern region, it must be emphasized that the data refers to coastal fishing and does not include river and lake fishing, which enjoy great regional importance (Table 5).

In summary, artisanal fisheries is more important than industrial fishing in the north and northeastern regions and less important than industrial fishing in the south/southeastern regions.

5. LABOUR FORCE AND TECHNOLOGY

It is extremely difficult to estimate the number of artisanal fishworkers because, as we have seen, it depends on the criteria adopted to define them. The number of marine artisanal fishermen increased from 112,318 in 1967 to 248,370 in 2000, due not only because of natural population increase but also because of migration from the countryside.

In 2000, it was estimated that there were about 248,370 fishworkers on the Brazilian coast, organized into guilds (*colonias*), with the northeast having more or less 61 per cent of these, followed by the north, with 29 per cent. The south has 9.5 per cent, while the southeast has 12 per cent of the total number of guilds (Confederação de Pescadores, 1986, Table 6). It is estimated that the number of marine artisanal fishermen is much higher when fishermen not associated with guilds are taken into consideration (only along the coast, without taking into consideration the inland waters).

Table 6: Number of Fishworkers Associated with the Guilds Regionwise (1967-2000)

Years	1967	Percentage of Total	1986	Percentage of Total	2000	Percentage of Total
North	8,362	7.4	49,393	19.0	72,164	29.0
Northeast	39.732	35.3	104,759	40.4	152,548	61.4
Southeast	9,703	8.6	47,522	18.3	29,931	12.0
South	19,723	17.5	57,506	22.2	23,658	9.5
Total	112,318	100	259,212	100	248,370	100

Source: SUDEPE, 1967; Confederação Nacional dos Pescadores, 1986 and IBGE, 2000

Another important factor is the place of residence; around 51 per cent of artisanal fishermen live in rural areas, against 49 per cent in urban areas. In the north and the northeast, artisanal fishworkers live mainly in rural communities, while in the southeastern region, they are mainly urban dwellers. Given that these data of the IBGE refer to the 1970s and keeping in mind that rural-urban emigration was high in that period, it can be presumed that the degree of urbanization of the artisanal fishworkers is much higher now (Table 6). The artisanal fleet comprises 49,105 boats, of which 42,850 are non-motorized, and 6,335 are motorized. The northeast has the largest number of motor boats (around 35 per cent), followed by the south (Rio Grande do Sul and Santa Catarina) with around 30 per cent, according to SUDEPE.

6. ORGANIZATION OF ARTISANAL FISHING AT THE REGIONAL LEVEL

The vast expanse of the national territory, and the diversity of the aquatic ecosystems and fishing methods, call for a regionwise analysis. The Brazilian coast is divided into four major coastal regions: the northern region, the northeast, the southeast and the south (Figure 4).

Figure 4: Relationship Between Marine Artisanal/ Industrial Production by Region

6.1 NORTHERN REGION (FROM AMAPÁ TO PIAUI STATE BORDERS)

Geographical Characteristics

The northern region is a vast continental platform formed by sedimentary deposits brought by the River Amazon. These waters are highly productive and this is one of the areas with maximum fishing potential in Brazil. It is an area with extended mangroves and very productive inlets, where an important number of artisanal fishermen live.

Production and Technology

A large proportion of boats are non-motorized, in particular in the communities of artisanal fishworkers, and motorboats are used in urban centres and ports, such as Manaus and Belém.

According to Maneschy (2000), the State of Pará has both industrial as well as artisanal fisheries. For the first sector, the main focus is the external market (domestic and international). Artisanal fisheries supply the local, regional and national markets. The traditional sector comprises a heterogeneous mix of people and social conditions. The industrial fleet comprises a little over five per cent of the total fleet, and is greatly outnumbered by the artisanal fleet. According to IBAMA figures, in 1998 there were 3,966 boats in the 15 coastal municipalities of Pará. Of these, only 204 belonged to the industrial sector. A large number of small boats are non-motorized. Wooden boats, up to 12 m long, predominate. While the industrial fleet operates motorized trawling, both for fish (the *ariidae*, catfish, being the main catch) and for prawns, the traditional fleet employs mobile gear, using nets and *espinhéis*, which are longlines with hundreds of hooks.

The types of boats used for small-scale fishing are of indigenous and Portuguese origin. While these are fishing boats, the *geleiras* are boats used for the transportation of foodstuffs and ice, and, in general, belong to traders who buy fish from the small fishers. The most important species captured by the artisanal method are shrimp, *gurijuba*, *piramutaba* catfish, *corvine*, *dourado* and crab.

Until 1970, almost all the fishing in the region was artisanal. This was the period in which pioneer fishing firms began to be established, dealing in the capture of *piramutaba* catfish and shrimp for exports.

The total potential for sustained capture is between 390,000 and 480,000 tonnes. In 1997, the total production was 139,645 tonnes or almost

20 per cent of the total national catches. Out of this, around 70 per cent is a product of freshwater fishing, as the northern region is the only one in which the yield from rivers and lakes is higher than the marine yield. Artisanal fishing is important in this region, accounting for 83 per cent of marine production, and the percentage gets higher for river and dam fishing.

According to Barebosa, Lima and Maneschy (2000), aquaculture is relatively new in this region. The government is making efforts (through the State Agriculture Ministry, for example) to develop the potential in the region, which, according to experts, is high, given the hydrological conditions (Moraes-Riodades, personal communication). According to Val *et al* (Moraes-Riodades, unpublished), there are around 450 aquaculture farms in the Pará State, in which 16 municipalities cultivate fish and shrimp species. The main native species are cultivated mainly by medium and small producers. Some fishworkers' *colônias* (recognized organizations that represent fishermen at the municipal level), like Araní, Cametá and Abaetuba support the practice of aquaculture by fishworker families, as it provides additional income for poor people.

Organization of Fishworkers

As mentioned earlier, the northern region houses nearly 20 per cent of the total fishworkers in Brazil, a majority of them being artisanal fishworkers. The fishworkers are organized into *colonias*, whose membership is obligatory. There are four *colonias* in Amapá and 44 in Pará. A considerable number of the presidents of these *colonias* are not members of the fishing profession, the same being the case with town councillors and fish traders. They, however, exercise great influence on the fishworkers, which is a limiting factor in finding solutions to the problems that besiege the sector in the region. Of late, as a result of the activities of NGOs like the Church and MONAPE, there has been a move to change the orientation of some *colonias* in the area (Santarém, in Pará) with the introduction of elections for the post of president.

The social relations among artisanal fishermen are based on the sharing system. Through this system, the owner of boat/gear receives 50 per cent of the shares, while the remaining catch is divided among the fishermen.

The funding of the fishing operation is done through moneylending, locally called '*avio'*, by which the fish trader takes care of the fishing expenses, and the costs are deducted from the total value of the catch. The boatowner, in general a broker, gives the fisherman an advance to cover the susbistence needs of the family he leaves behind. The fishers, on their part, agree to sell the entire produce at a stipulated price, which is much lower than the market

value. In this system, the fishers are totally dependent on the broker financing them.

Some government programmes were established in the region to overcome the problems of traditional funding for fishing operations. Fishworkers have co-ordinated with farmers, workers involved in extracting industries, and other segments of producers from Gritos da Terra to obtain subsidized credit for fisheries. The result of these negotiations has been the creation of lines of financing for social development, like *Crédito Produtivo*, the special State government finance programme that offers credit to finance purchase of production equipment such as boats, nets and motors.

The Professional Education Programme (PEP) has been introduced by the Labour Ministry for training fishing communities in methods of fish capture, processing and handling. In spite of the lack of opportunities for the practical application of what was learned, and the lack of continuity in the programme, this was perhaps the first effort on the part of the government to educate fishworkers on the finer aspects of their jobs (Barbosa, Lima and Maneschy, 2000).

Marketing

The weakness of the onboard storage, transportation and marketing systems is the cause of the very high levels of loss or damage to the products of the fishermen. To improve the marketing system, the federal government planned a programme for the construction of fishing ports in Belém and San Luis, financed by the InterAmerican Development Bank. The programme also included the construction of intermediary ports along the coast, as well as the acquisition of boats and fishing gear. However, many of these facilities, such as ice factories and cold storage rooms, instead of benefiting small-scale fishermen, as planned, fell under the control of private firms and fish traders.

6.2 NORTHEASTERN REGION

Geographical Characteristics

The northeastern region begins in Foz do Parnaíba (Piauí) and ends in Cabo Frio, in the state of Rio de Janeiro. This region is a narrow continental platform with large areas of reefs containing corals and calcareous algae. Owing to the type of seabed, the trawling techniques are limited. The northeast is a region with many large sandy beaches covered by palm trees, with a semi-arid climate and quite regular wind conditions. The coast is not very jagged and rarely offers safe harbours for the boats. From Cabo Calcanhar onwards, reefs appear running parallel to the coast until near Recôncavo Baiano.

Production, Technology and Marketing

A raft specifically adapted to the geographical conditions of the area was developed by the locals. Known as the '*jangada*', it is a simple construction of wood and sails, and is highly stable, with the ability to berth on any type of beach and to sail above the reef barriers. Of late, the difficulty in finding the right type of wood for their construction has restricted the replacement of these rafts. Besides these, there are a large variety of boats used in this region, such as the canoes used in lagoons and inlets, sailboats, motorboats, etc.

The species of maximum importance in artisanal fishing are lobster, mackerel, sawfish and dogfish. In 1997, the regional yield was 188,023 tonnes, that is 20 per cent of the total produce in Brazil. Around 70 per cent of the production is from marine fishing.

Artisanal fishing is of great importance in this region. In 1995, it accounted for 84 per cent of the total production. Industrial fishing concentrates on lobster and the lane snapper.

The estuarine production is drawn from the inlets, bays and lagoons, with the help of gear such as encircling nets, beach-seines, and longlines. The most harvested species are the catfish and crab. In some States, there is a special type of fishing in 'ponds', an incipient cultivation technique in which the young hakes are trapped in the estuaries where they grow. The ponds manifest high productivity (around 1 tonne per hectare) and need small investments. These, however, are threatened by environmental degradation.

Another technique used is the *caiçara* (brush park made of branches put into water to attract fish), in the lagoons of Mandaú and Manguaba, in Algoas, where the branches are deposited into the bottom to attract hakes that are bred there. Among the estuarine species worth mentioning are the *caranguejo-uçá* (*Ucides cordatus*) a variety of crab, captured mainly in Sergipe, Pernambuco and Bahia; the fishery is an alternate source of income for a large number of poor fishers and their families.

Coastal fishing exploits the highly fertile and less productive ecosystems of the continental platform. Rafts and sailboats are used to exploit these isolated regions in the coast. The major species captured are mackerel, sawfish, flying fish and swordfish (pelagic). Among others are the lane snapper, grouper and giant croakers, besides the lobster.

Organization of Fishworkers

In the northeast, there are 273,315 fishworkers, more than the total number of artisanal fishworkers in Brazil. Of these, 104,759 are organized into 157

colonias. Maranhão (30,476) and Bahia (24,174) are the States that have a high number of artisanal fishworkers (Table 6).

The following are some of the main obstacles in the development of fishing:

1) Limitations on the expansion of fish yield. Unlike the northern region, the northeast has already achieved the maximum sustainable yield, with little possibility of an increase in the physical volume of fish production. In this sense, the regulation to reduce fishing activity takes on a special dimension. The regulatory measures, in general, affect the artisanal fishworkers more, as they have very meagre incomes. Any step that implies a further reduction in their income, is, in general, favourable to industrial fishing, and is not accepted voluntarily. In many cases, the necessity arises to create employment outside the fishing sector, in integrated rural development projects.

2) Tight control of the marketing structure by middlemen. The existing system allows the profit of the intermediaries to be excessively high, while the incomes of the fishers remain very low.

3) Administration of the *colonias* by non-fishers. The patronage system, through which small-scale fishermen are dependent on middlemen, hinders a democratic representation of fishermen in the guilds or *colonias*.

4) Degradation of the coastal environment. Rapid urbanization, uncontrolled development of tourism and the location of industrial belts in estuaries and other rich ecosystems have led to a decrease in the natural productivity of the ecosystems and of fishing itself. Alternatives such as coastal aquaculture are threatened by the contamination of the waters. A very serious source of pollution of these ecosystems is alcohol production, in which alcohol manufacturers directly dispose off their toxic wastes (*vinhoto*) into the estuaries. This phenomenon is very serious in States such as Pernambuco and Alagoas. Offshore petroleum drilling also poses a high risk to the coastal environment, from Sergipe to Bahia. On the other hand, highly productive lagoons such as the lagoons in Mundau and Munguaba (Alagoas) as well as important bays, for example the Salvador Bay, are being threatened by the dumping of toxic wastes into the waters (Figure 3).

5) Lack of capital. Although the region has benefited from credit financing programmes, the lack of working capital and capital for replacement of gear is a serious constraint for small-scale fisheries development.

6.3 SOUTHEASTERN/SOUTHERN REGION

Geographical Characteristics

There are two regions: the southeastern, from Cabo Frio to the Cabo Santa Marta in Santa Catarina, and the southern region, from Cabo Santa Marta to the southern border of Brazil (the Chuí river). The two regions are similar from the oceanographic point of view. The continental platform has a muddy bed, allowing for trawling in a large part of its area. In the south of Brazil appears the Malvina Current, creating a tropical convergence responsible for a considerable increase in the natural productivity.

Production and Technology

The southeastern region (the State of Rio de Janeiro, Espírito Santo and São Paulo) has, according to FAO, a maximum sustainable yield of 275,000 to 300,000 tonnes/year. In 1997 catches reached 162,885 or 22 per cent of the national harvest. On the other hand, from Rio de Janeiro towards the south, artisanal fishing loses its importance in relation to industrial/firm-based fishing, which is responsible for around 77.5 per cent of the capture (in 1995). This is due not only to oceanographic and biological factors (trawling facilities, large biomasses of pelagic fish) but also to the incentives given to fishing industries by SUDEPE after 1967. The southeastern/southern region absorbed more than 90 per cent of the total of fiscal incentives.

The southern region shows the highest fish yield in the country, with 30 per cent of the total yield in 1997. Artisanal fishing contributes only 18 per cent to the total marine catches.

The main fish resources exploited are the shrimp reserves (white shrimp and *camarão sete-barbas*, plain fish, weak fish, catfish and small anchovies. Apart from the *camarão sete-barbas*, many other species are harvested in bays and estuaries by artisanal fishers. Out of the resources exploited by artisanal fishing, only the *camarão sete-barbas* has achieved the estimated maximum sustainable yield.

Two of the largest estuarine complexes in the country are located in the southern and southeastern regions: the Iguape-Cananéia in São Paulo, and the dos Patos lagoon Rio Grande do Sul. Besides these, there are smaller estuaries spread out in the region.

In spite of the potential that small-scale fishing has, fishers complain of the continually depleting stocks. Some studies, though, point to the possible misuse of the coastal resources and to the effects of sea pollution as far more damaging than an increase in fishing activity per se.

In fact, a large number of the estuaries face serious problems of environmental degradation, as for example, the Dos Patos lagoon, an important fish nursery

near which the southern petrochemical belt is located with numerous chemical industries, cellulose paper factories, tanneries, etc. (Figure 3).

Organization of Production and Technology

The southeastern region has fewer registered artisanal boats (2,855), around 6 per cent of the total number in the country, 30 per cent of them being motorized (the largest percentage of the country). The southern region has 16,744 boats, of which only 3.5 per cent are motorboats. The non-motorized boats operate mainly in the estuarine regions.

The Santa Catarina and Rio Grande do Sul region has a better organizational structure due to the presence of experienced Portuguese and Azorian fishers, who migrated to Brazil. The region also has a dynamic artisanal sector comprising fishers who utilize boats of Portuguese origin called *baleiras* and are mainly involved in shrimp fishing.

While the motorboats in the coastal zone use small shrimp trawls and set nets for fish, in the coastal estuarine areas a large variety of gear such as encircling nets, trammel nets and beach-seines are used.

Organization of Fishing

Several sharing systems exist between members who participate in the fishing activity. In motorized fishing, after putting aside the expenses for food, ice and fuel, the catch is divided equally between the owner of the fishing equipment and the workers. In lagoon fishing, according to the traditional system, one-third of the production goes to the fishers and two-thirds for the proprietor of the gear when he participates in the fishing.

The marketing system has been modified greatly in the last few years with the proliferation of companies that buy the yield from the fishers through the fish vending posts. In some cases, the role of the middlemen remains important, although this region is home to success cases in the operation of co-operatives.

Organization of Fishworkers

In the southeast/southern region there are approximately 180,760 artisanal fishworkers, of whom half are members of the *colonias*. Santa Catarina and Rio de Janeiro have the maximum number of artisanal fishworkers in the country (Table 6).

The main problems in the region relate to conflicts with industrial fishing, which infringes into the coastal areas and estuaries; invasion by the tourism industry and purchase of land on beaches and areas where artisanal fishing is carried out; environmental deterioration due to the presence of large industrial centres; and the lack of organization of the fishworkers.

7. SOCIAL AND INSTITUTIONAL ORGANIZATIONS OF ARTISANAL FISHWORKERS

7.1 ARTISANAL FISHING INSTITUTIONS

Artisanal fishworkers are organized into '*colonias*', similar to the Iberian guilds, created at the beginning of the century by the Brazilian Navy. The objective of the creation of these *colonias* was to organize the fishworkers spread out along the coast as reserves for the Navy. The directors of the *colonias* are elected by the fishworkers who are legal members, and they, in turn, elect the president of the Provincial Federation. The president of the National Confederation was personally nominated by the Agriculture Minister, to which the fishing sector was institutionally attached until 1989.

Until the 1988 Constitution, a majority of the directors of the colonies were representatives of other social and professional sectors, such as fish traders and lawyers who utilized the fishworker organizations for political purposes. In 1973 a new statute was established for the *colonias*, but no substantial changes occurred as this new law was promulgated during the military regime and there was no consultation whatsoever with the fishworkers.

At the beginning of the 1980s, for the first time, the artisanal fishworkers of Pernambuco in the northeast region organized mass meetings against the environmental degradation of the rivers and estuaries, caused by the large sugarcane mills. The movement to re-democratise the country, towards the end of the military dictatorial regime, had an important influence on the democratisation of the electoral process, principally in the northeast, where the Pastoral dos Pescadores (Pastoral of Fishworkers), created by the Conferência Nacional dos Bispos de Brazil (National Conference of Bishops of Brazil), played an important role. After 1986, the Movimento pela Constituinte da Pesca was organized, where, for the first time, the artisanal fishworkers could put forth their demands to the National Congress: these dealt with the right to free and democratic association, an end to fiscal incentives for industrial fishing, labour rights, recognition of women's work, development programmes, control of environmental degradation, and so on.

In 1989, with the declaration of the Constitution, the Movimento pela Constituinte da Pesca phased out, but MONAPE, the national fishworkers' movement, was created, with a base among the artisanal fishworkers of the country. The main challenge for MONAPE is the stimulation of an independent and democratic organization of artisanal fishworkers, seeking to

maintain the rights earned by the 1988 Constitution and fight for new social and labour rights. MONAPE has organized various national meetings of its members, also inviting representatives from organizations of fishworkers from neighbouring countries, like Conapach, in Chile. MONAPE is active only in the northern regions, where it has its base, and in some States of the northeast. Unfortunately, in the 10 years of its existence, MONAPE has not succeeded in establishing itself as a national movement capable of offering alternatives to the existing institutional framework that, as mentioned before, is marked by protectionism and the lack of clear and effective policies favouring artisanal fishing.

Until the Constitution of 1988, fishworkers were allowed to organize themselves only into the traditional *colonias*, whose role was mainly one of social service. The new constitution allowed fishermen to create their own trade unions, although few of these unions were established effectively. In the 1980s, the Pastoral de Pesca, linked to the Catholic Church, began the work of securing for fishworkers the rights extended to other workers, such as retirement benefits. Today it is possible for fishworkers to subscribe to schemes of the National Institute of Social Security, as autonomous workers who pay a contribution until retirement at 60 years for men and 55 years for women. They can, according to the Organic Law of Social Security, apply for retirement on grounds of health problems, health benefits and maternity allowances. In the regions that suspend fishing activity for some months for the regeneration of species, the fishermen associated to the *colonias* receive an allowance as compensation for the fishing holiday.

According to Barbosa, Lima and Maneschy (2000), the inclusion of fishworkers in the 'special insurance' category of pensions and social security can be considered a major victory for the fishermen's social movement. Provisions such as these mean that men can receive pensions and other benefits, which, though limited, are part of any citizen's rights. Also important is the unemployment insurance for riverine and inshore fishers, though this has been restricted to those places where 'closed areas' have been instituted for the reproduction of fish stocks.

7.2 THE ROLE OF WOMEN

In different regions of Brazil, mainly in the northeast and the north, women have traditionally participated in fishing as *marisqueiras* (shellfish collectors), *pescadeiras* (fishing along the seashore) and in the processing of fish, both in the artisanal and industrial fisheries.

Until the1988 Constitution, women were not legally permitted to work in fishing, due to the fact that it was considered a male activity. Before this, the SUDEPE only allowed women to work as collectors of shellfish or algae. It was only in 1988 that a Presidential Act abolished the prohibition on female labour in fishing.

In spite of such legalisation, women rarely participate in deep-sea fishing, as the fishermen consider that their presence in the boat brings bad luck (*'panema'*). This situation is slowly changing and in some States of the north and northeast, some women work with their families in small-scale fishing. There are also cases of widows who work alone on artisanal fishing boats. Some of these women are now even presidents of fishworker *colonias*, but these are still isolated cases.

The majority of women work as *marisqueiras*, collecting shellfish during the tide and selling them to supplement the domestic income. In some States of the northeast, like Bahia, the *marisqueiras*, around 20,000 in number, participate actively in the domestic earnings. In States such as Maranhão, women participate in fishing "on foot" with small shrimp nets. The shrimp is brined, dried and sold by the women. This activity is also common in other States of Brazil.

In some fishworker communities the women's activities consist of weaving and darning fishing nets. In many other communities, women work in small-scale agriculture, producing *yucca* flour, which is the basic diet of the coastal populations.

Urban industrial employment is another field where women are active participants, working mostly in the fish-processing industry. In many cases, the workforce in the industry is almost entirely female.

According to Barbosa, Lima and Maneschy (2000), in the northern region, women participate in fisheries in various ways: they fish in shallow waters close to home though they do not fish at all when pregnant or menstruating, giving in to social and cultural pressures. Most of the times the product is meant for sale, as is the case with shellfish harvesting in the mangrove swamps and beaches. But sometimes it is used for domestic consumption and distribution among a network of relatives. Among other activities related to fisheries, women engage in the making of fishing gear and in fish processing. The absence of regular buyers, low prices and delays in payment are the common problems they face.

Women from coastal communities too had a more regular and active role. Records reveal that in the era of sailboats, fishing used to be carried out much closer to the land as there were more fish there. With the introduction of motorboats around the beginning of the 1970s, and with the advent of the industrial fleet, pressure mounted considerably, making it necessary to go out much farther into the sea, for longer periods. Thus it became difficult for women to participate more fully in open-sea fishing.

Women who continue to take an active part in fishing are still accorded the status traditionally given them. Their activities are viewed as 'support' for the running of the household. A majority of the *colônias* follow the traditional sexual division of labour. The 'double-workday' of women continues to be thought of as 'part-time activity'. A woman involved in the administration of the *colônias* is still considered a little 'out of place'.

The State of Pará has been witness to a new trend over the past five years. Over 10 per cent of the registered members of the *colônias* there are women. They are seeking alternatives to traditional set-ups like the *colônias*. Several women's associations have mushroomed where women hold positions of importance.

There have been several motivating factors behind this new beginning. The attempt to generate income, and explore alternative avenues to do so, is one important reason why women have united to form associations. Government programmes and the initiatives of non-governmental bodies directed at small producer groups have also influenced these women's organizations. Groups that already existed in the community–mostly linked to the Catholic Church, like Mothers' Clubs or Grassroots Ecclesiastical Communities–are enthusiastically supporting these new associations. Where the *colônias* have opened up and admitted women, integration has followed naturally. Once groups are formed, the exchange of ideas and access to new social spaces has meant a reconsideration of traditional roles. Such groups tend to follow examples set by other organizations that have been successful in welcoming women into their fold (Barbosa, Lima and Maneschy, 2000).

The role of women in fishing was highlighted in the 1990s by the Pastoral da Pesca, MONAPE and by NGOs such as Terramar, with the support of the International Collective in Support of Fishworkers (Maneschy. M, 1999), who organized specific meetings to discuss the problems and the potential of women in fishing.

8. COASTAL COMMUNITIES, TRADITIONAL KNOWLEDGE AND MANAGEMENT

The coastal ecosystems of Brazil present not only a remarkable biodiversity but also a variety of human cultures. In the southern coast, between Rio Grande do Sul and Santa Catarina, live the Azorian, descendants of the migrants who came from the Azores Islands in the 17th century. In the first generations they were both peasants and fishermen, but from the late 1940s they have concentrated mainly on fishing activities. Close to the Azorians, appear the Caiçaras, who live between Paraná and the State of Rio de Janeiro. They are descended from the Indians, Portuguese colonizers and African slaves, and practise small-scale agriculture associated with artisanal fishing. In the northeast coast, from Bahia to Fortaleza, live the *jangadeiros,* raft fishermen who depend almost exclusively on artisanal fishing using the *jangada*, a raft with sails that is very suitable for the type of sea, wind and sandy coast of the area.

8.1 THE IMPORTANCE OF THE TRADITIONAL KNOWLEDGE OF ARTISANAL FISHERMEN

The different coastal cultures in Brazil have a set of knowledge and management practices associated with the sea and fishing activities. In recent years, researchers have emphasized the importance of the knowledge produced and orally transmitted by traditional fishermen, and the potential role traditional fishing and related environmental knowledge can play for the development and implementation of fisheries management in the modern world (Ruddle, 2000; Cordell, 2000). As Ruddle (2000) points out, traditional knowledge continues to guide and sustain the management of many traditional, community-based fishing systems as well as governs fishing decisions and fishing strategies. Local knowledge systems are empirically based and designed for practical purposes, for example, to inform decision-making about where to fish daily and seasonally. Local environmental knowledge domains characteristically include much valuable information about fish behaviour, location, distribution and availability of species, taxonomies and habitat classifications. Over time, as this knowledge is transmitted to new generations of fishers, it helps communities maintain and constantly renew ties to fishing grounds and access to a continuous supply of marine aquatic resources, particularly in tropical countries where biological data are scarce or non-existent.

Spheres of local knowledge range from references to classification of aquatic species, fish behaviour, taxonomy, patterns of reproduction and migration of

fishes, and feeding inter-relationships among species, to physical and geographic characteristics of the aquatic habitat, climate (cloud formation, winds, storms, weather change), principles of navigation and functioning of diverse fishing techniques in a range of micro-environments. Traditional knowledge may also reflect people's association and connections with the spiritual world, for example, demarcation of sacred sites in the sea, creation myths and story places.

a) Areas and Subjects of Traditional Knowledge

Various maritime anthropology and ethno-ichthiology studies illustrate the richness and resilience of artisanal fishing knowledge in Brazil. Glaucia Silva (1997) records the analytical categories of the fishers of Piratininga (Rio de Janeiro), while Begossi (1989) documents the species nomenclature and criteria for fish classification system fishermen use on Búzios Island, (São Paulo). Cunha and Maldonado (1989) have described how fishing knowledge operates among artisanal communities and fishermen in Paraná and along the Paraíba coast. Diegues (1983, 2000) explains how traditional knowledge functions in the rocky fishing grounds of Rio Grande do Norte and Espírito Santo States. Forman (1970), Cordell (1983), Mourão (1991) and Marques (2001) have made important contributions to the study of traditional knowledge in Brazil.

Thus*, traditional fishing knowledge* may be understood as a distinct cognitive realm: on the one hand, consisting of a replicable, orally transmitted set of specialized skills and culturally shared practices and beliefs that have stood the test of time, enabling people to make a living from coastal and marine environments, working from small boats and relying on artisanal techniques; on the other hand, traditional fishing knowledge exists in more encompassing symbolic and conceptual frameworks governing social relationships and spiritual connections to inland aquatic, coastal and offshore marine habitats.

It can also be defined as a cumulative body of knowledge and beliefs about the relationship of living beings (including humans) with one another and their environment, handed down through generations by cultural transmission (Berkes, 1993).

Some areas and subjects of traditional fishing knowledge are:

Fish Taxonomies

In some Brazilian fishing communities, fish have a great importance in native classification, being most meticulously classified into categories built upon multiple criteria. This deference to fish is made clear by the use of the 'family'

category, which is meticulously applied to fish while receiving quite casual application in the case of other animals and especially plants. This special treatment given to fish should be seen within a set of conceptualizations that approximate them to man since both form the articulation between land and sea.

Habitats Classification

In addition to species of fish, certain rocky fishing grounds are classified and designated by the names of the fishermen who discovered them (Galvão, 1968; Diegues, 2000). Some of these rocky habitats are very rich in fish species and were kept secret by their 'owners'. These territories have no visible markers or borders, but are respected by other fishermen. Local sea tenure systems are based on long-established knowledge traditions containing detailed information on ecological features of the sea territory.

Cunha (1997) highlights the relationship fishermen perceive between physical characteristics of the ocean and the social production of knowledge. According to Cunha, fishing knowledge is culturally produced and accumulated through professional practice and continually recreated according to the features of the maritime environment, which presents itself as cyclic, mobile and unpredictable. In other words, the appropriation of the sea and its resources is expressed in the principle and practice of "knowing-how" marine territory is constructed and ritualized by means of tradition, apprenticeship, experience and intuition. This knowhow is only attainable by those with experience and intuitiveness, which come from understanding what tradition is in specific cultural and work/production contexts of fishing apprenticeships.

Fish Behaviour

Detailed feeding habits are described by fishermen (Marques, 2001) in Marituba lagoon at the mouth of São Francisco River in the State of Alagoas. Local fishermen describe fishing habits of many species, and use their knowledge to select appropriate baits. Knowledge of feeding and reproductive behaviour is also used to organise fishing activities. As an example, during the first rains, when fish makes noise ("snores"), this means they are ready to spawn; thus it is time to prepare fishing traps (*covos*).

Marques (1991) has studied the *caiçaras,* a brush park used in the coastal lagoon of Mundaú and Manguaba, in Alagoas, from an ethno-ichthiological point of view. He observes that fishermen distinguish fish that live in the *caiçara* more or less permanently, such as the *mero (Epinephelus), carapeba (Eugerres brasilianus),*

camurim (Centropomus sp) and *caranha (Lutjanus cyanopterus)*, from species that only temporarily seek shelter in the brush parks, such as the *salema (Archosargus* sp) and *vermelha* (*Lutjanus* sp*)*.

The movements of fish and their migration patterns are also precisely known by many artisanal fishermen along the Brazilian coast. A good example concerns the migration of mullets (*Mugilidae*) during the winter from Brazil's southern coasts to the northern coasts. The first cold winds in May mark the beginning of the mullet migration. Numerous artisanal communities continue to rely heavily on this species for their livelihood.

The ability to locate and keep track of fish aggregations is another realm of fish behaviour known in intricate detail by many small-scale fishermen in Brazil. Signs of spawning aggregation are identified by *ardentia*, the scintillation produced by shoals of certain pelagic fishes (such as sardines) during the nights without moonlight. This indicates that fishermen should prepare to deploy their encircling nets.

Ruddle (2000) also mentions that knowledge of predictability of food fish in prime spots is widespread in traditional fishing societies throughout the tropics. Calendars, devices and mental maps, which enable fishermen to track fish behaviour according to lunar phases, are among the most critical tools of possible events in the marine ethnobiology of fishing.

8.2 SOCIAL AND CULTURAL CHARACTERISTICS OF THE KNOWLEDGE

The knowledge systems described above tend to develop within traditional societies or communities that (a) maintain strong economic and symbolic ties with the land and the sea through continuous observation of natural cycles; (b) promote attachment to continual use and occupancy of a specific group territory, which allows a community to reproduce itself through ongoing traditions of communal and family land and sea tenure; (c) allow subsistence activities to continue to play a vital role in fishing, even in conjunction with, and an increasing focus on, market production; (d) have individual/family ownership of the means of production; (e) have limited accumulation of capital; (f) structure crucial socioeconomic relations along family, domestic and communal kinship lines; (g) use relatively simple technology, with limited impact on the environment; (h) have sites of marginality from political power bases that tend to be concentrated in urban centres; (i) have oral traditions responsible for the production and transmission of knowledge, symbols, myths

and rituals associated with artisanal fishing and sometimes with small-scale agriculture; and (l) encourage a certain degree of social/cultural identity based on fishing and other maritime activities.

Artisanal fishing knowledge should not be judged or seen as pre-logical or pre-scientific. Silva (1997), following Levi-Strauss (1978), points out that traditional production and ecological knowledge are based on long observation of recurrent natural phenomena, which allows a fishermen to make decisions about the timing of fishing activities, selection of favourable fishing locations and the use of appropriate techniques for specific species. Without this fine-tuned knowledge, it would be impossible for fishermen to earn a livelihood within an ever-changing and frequently dangerous marine environment.

The construction of this body of complex and detailed concepts and symbols is based on a long-term empirical observation and is applied to rather small marine areas used by local fisherman, and can seldom be replicated elsewhere. It also guides their behaviour and fishing strategies, and is essential for predicting situations where fishing can be successful. In this sense, traditional knowledge helps local fishermen to produce their own mental maps that indicate to them where and how to fish.

8.3 SYMBOLIC ASPECTS OF THE SOCIAL APPROPRIATION OF THE SEA

The social appropriation of the sea implies not only an extension of social relationships on land and the accumulation of local environmental knowledge. It also involves the formation and symbolic expression of links with the spiritual world. Conceptions and representations of the natural world and its resources differ greatly between subsistence and market-oriented societies. Godelier (1984) argues that these two societies have different rationales, and each displays a system of social rules consciously elaborated to best attain a set of objectives. According to this anthropologist, each economic and social system creates a specific mode of exploitation of natural resources and use of the human labour force and, consequently, utilizes specific norms of good and bad use of natural resources.

According to Godelier (1984), at the heart of our material relationship with nature, there is an underlying non-material bond that unites the three key functions of knowledge: to simultaneously represent, to organize and to legitimize our social relations and our relations with nature. In order to understand the process of material production, it is essential to understand the symbols and myths used by fishermen to represent the sea and its beings.

The production process involved in fisheries generates a range of symbolic elements through which fishermen act not only upon nature but in concert with supernatural forces that may favour a successful fish catch or punish those fishermen who are too ambitious.

Thus, together with defining a space for economic reproduction and projecting principles of social relations, marine territories can also be the locus of representations and of the mythological imagination of these traditional societies. The intimate relation of these people with their surroundings, and their greater dependency on the natural world when compared with urban-industrial societies, results in the cycles of nature (the arrival of schools of fish and the abundance of crops) being associated with mythical and religious explanations.

Caiçara communities along the southwest coast of Brazil use both the Atlantic Forest resources as well as associated estuaries, mangroves and marine environment. They also do not have a fear of fishing in the estuaries and coastal lagoons**,** but many fishermen have a dread of the *mar de fora* (open sea) and the *passagem da barra* (going beyond the mouth of the estuary), where storms might occur, sometimes resulting in loss of boats and human lives (Mourão, 1971).

Many artisanal fishermen are Catholic, although the number of Protestants has been increasing in the last decades. In some areas, however, there is a great influence of the cult of *orixás*, who follow the Afro-Brazilian religious tradition.

The most known Catholic centers of pilgrimage in Brazil are located along coasts and rivers, and have strong relationship with waters. Examples are the sanctuary of Our Lady of Nazaré, in Belém, where the most impressive procession, with over 1 mn participants, takes place in October, and when innumerable signs and symbols of the maritime and fluvial life are shown. In Salvador of Bahia, our Lord of Bonfim (Senhor do Bonfim) is also the protector of the seamen, as it is *Yemanjá*, goddess of the sea in the Ioruba-Brazilian religious tradition. The black image of Our Lady of Aparecida, protectress of Brazil, has been taken from the river by fishermen in the 18th century. Along the southern coast, several churches are dedicated to Our Lady of the Seamen (Nossa Senhora dos Navegantes). It could be said that although Brazil has been, until recently, an agrarian country, the sea has a strong influence on people's religion.

The sanctuary of the Holy Lord of Iguape, in the coastal area of São Paulo, is particularly linked to the maritime life and its dangers, as it is deeply influenced by the Azorian immigrants who moved to southern Brazil in the 17th century. The image was found by Indians along the coast and was probably put into the sea by the Catholic Portuguese when attacked by a Protestant ship in 1647.

Since the 18th century, the Church of Iguape became a centre of important pilgrimage, particularly of the Azorian immigrants, as they venerated a similar saint, the Terceira and São Miguel Island, in Azores.

One important element to explain the relationship of the religious behaviour of the Azorians in Brazil is that they became the most skilled fishermen of southern Brazil. At the same time, the sea in that region is stormy, insidious and dangerous for the seamen and fishermen. Even today, most of the wrecks of fishing boats occur in that sea, and such shipwrecks were even more frequent in previous centuries (Diegues, 2002).

When fishermen from Santa Catarina and Rio Grande do Sul came in pilgrimage to Iguape to the celebration of the Holy Lord, they used to bring miniatures of boats and paintings as payment of their vows to the saint when faced with danger at sea. Particularly, the paintings show dramatic moments when the boat was threatened by a storm and was at risk of capsizing. In some of these, *ex-votos* fishermen are shown on their knees, praying, and on the top there is the painting of Bom Jesus de Iguape (Our Lord). When a fisherman himself was not in a position to make the long trip to the church, which could take a whole week, he would put a miniature of the boat on the south-north sea current. He hoped that those who found the small boat would know that it should reach Iguape in the north, as it was a religious vow (França, 1972).

The maritime *ex-votos* were frequent until the 1960s, when they became rare and, in some cases, were replaced by a photo of the boat and its fishermen. The reasons for this could be the urbanization along the southern coast and decrease of the traditional religiosity among fishermen. This period also coincided with the rapid industrialization of the Brazilian fisheries, when larger boats equipped with radio and sonars were built, resulting in a safer navigation. In the 1960s asphalted road linked Iguape to Santa Catarina, resulting in shorter travel by bus to Iguape, putting an end to pilgrimage by boat.

As far as the Afro-Brazilian religious tradition is concerned, one of the most popular *orixás* (gods) of the Afro-Brazilian pantheon is Yemanjá, the goddess of the sea. She is also considered to be the Mother of the fish (*Yeye*: mother

and *Eja*: fish, in Yoruba from Nigeria). The fishermen of Bahia, in particular those involved in the fishing of *cavalla* (*pesca do xaréu*), present their gifts to Yemanjá before their nets are launched from the shore. According to these fishermen, those who do not praise the goddess of the sea will have small catches, as Yemanjá protects the shoals. In the evening of 2 February, coastal communities, in particular artisanal fishermen, celebrate Yemanjá, and throw in the sea the gifts she likes, such as soaps, bottles of perfume and silver coins. Another important aquatic goddess is Oxum, the spirit who protects the living beings of rivers and water sources (Seljan, 1973).

The religious belief of artisanal fishermen, particularly in the Amazon, is influenced by Indian mythologies and legends. The popular imagination of the people of the Brazilian coastal forests, rivers and lakes is inhabited by magical beings that punish those who destroy the forests *(caipora/ curupira, Mãe da Mata, boitatá)*, those who mistreat animals *(anhangá),* those who abuse animals at the time of reproduction *(tapiora)* and those who fish more than necessary (*Mãe d'Água*) (Diegues, 2001). Thus, the inhabitants of the Várzea da Marituba in Alagoas have various legends, such as the *Mãe d'Água* (water mama), which sinks the canoe of those fishermen who are very ambitious and catch unnecessarily large amounts of fish from the lagoon.

Mythological beings called *ataídes* threaten those fishermen who use the mangrove without care in Marajó Island. In the lake Arari, also in the same island, fishermen say that there is a spirit of a big ray (*arraial grande*) that protect other fishes from human predation when they become trapped in small ponds during the dry season and are an easy prey of fishermen. In order to fish in those ponds, it is essential to ask permission from the "big ray", otherwise the fisherman may risk his life (Fares, 2001).

The mythical world of the *caboclo* fishermen of the Amazonian rivers and estuaries is filled with spiritual beings or *encantaria* of the forest or water, which can favour or harm him.

The worlds of forest and water are two separated domains: two extensions of the *caboclo*'s lives. There are supernatural entities (*caruanas*, *bichos do fundo,* animals of the deep), *mãe d'água*, the water's mother) capable of casting spells or haunting and bewitching those who abuse or disrespect the use-rights and rules pertaining to these environments. In this case, a belief that one should not harvest more than one need is reinforced. Like the forest, aquatic areas, along with their human inhabitants, also have their protective spirits, with the power to harass those who engage in destructive resource use. There also

exists the *cobra grande* (great snake), the *Tapiraiauara*, and the *onça d'água* (water leopard), which inhabit, respectively, the depths of lakes and the rivers (*igapós)*.

Fishermen understand they must avoid fishing in certain places and times for fear of meeting supernatural entities. It has been suggested that this fearfulness may act as a mechanism for limiting potentially damaging human-environment interactions, thus tending to prevent overexploitation of resources (Furtado, 1997).

An ongoing debate surrounds the natural resource conservation function of these mythological beings: Are traditional fishermen aware of the ecological intentions of these cultural practices? Can such practices actually facilitate conservation or be viewed as 'conservationist'?

Darrel Posey (1992) uses the emic/ethic approach to discuss the issue of intentionallity related to traditional practices. According to him, in some conservationists' minds, traditional practices that limit overexploitation of resources can be considered to enhance or support biological conservation, in the modern, scientific sense. Under these conditions, those practices mediated by beliefs in mythological beings purposely chosen to avoid overfishing may play an important role in modern fisheries management.

For Posey, this interpretation falls into the category of an ethic approach that is developed by the researcher. On the other hand, in the mind of a traditional fishermen (the emic approach), the function of beliefs about the behaviour of mythical beings may turn out to be something quite different. Fear of being punished by supernatural beings may function, for instance, to discourage capital accumulation and social differentiation in societies organized along egalitarian lines. In this connection, an emic approach to explain these practices is unlikely to be deliberately 'conservationist', at least not in the sense this concept is defined in Western science.

Inhabitants of many fishing communities in Brazil retain sociocultural affinities with their Indian ancestors. Indian cosmologies usually do not make clear-cut distinctions between animals and humans, but see life as a continuum in which all beings are inter-related through a network of different sociabilities (Descolla, 2000). Nature is not only inhabited by humans and the spirits of the ancestors but also by animals and their spirits. In this connection, the modern concepts of wilderness, biodiversity and pristine ecosystems are not able to explain the complex relationships between traditional communities and their environments. For example, in the worldview of these communities and cultures, the existing diversity of species is not only a natural phenomenon but also a cultural one

resulting from a long-term interaction between humans, habitats and non-human beings.

In the Brazilian context, several traditional groups are currently making efforts to incorporate the modern notion of 'conservation' in their discourses in order to gain the support of ecologists in their struggle for cultural survival.

8.4 TRANSMISSION OF LOCAL KNOWLEDGE

The ability to identify productive zones of the sea and to find one's bearings in the midst of the immensity of the sea, out of sight of land, is part of what has been called the "cognitive skill set of fishermen", which seems to be a direct and accumulative result in many fishermen's communities. This knowledge is not evenly distributed among artisanal fishermen but tends to be concentrated in the hands of boat captains and skippers (*mestres*).

There are various ways to transmit this knowledge set. In the case of the retrieval of submersed rocky fishing grounds in Galinhos (Rio Grande do Norte) described by Diegues (2000), the captain may show to his children or a selected crew member, the geographical signs in the continent he is using (mountains, church towers) to trace his routing. In other cases, an apprentice must learn informally through observation and imitating what the captain does. Instruction to acquire these aspects of fishing knowledge is rarely formal or consciously intentional.

9. THE TRADITIONAL APPROPRIATION OF THE MARINE ENVIRONMENT: SPACE AND SEA TERRITORIALITY

The concept of traditional appropriation of sea resources incorporates material as well as non-material aspects that define the relationship between fishermen and the sea. Modern concepts and tools for managing fisheries usually emphasize the economic, biological and administrative aspects of regulating fisheries. On the other hand, anthropological studies of fishing have been open to broader interpretations of what constitutes resource management in fisheries. In many cases, anthropologists have documented traditional territorial systems used to appropriate and manage sea space, which have been found to have meaningful fisheries management functions and implications. Local tenure customs that control access to fishing grounds can have management impacts that are similar to the quota and limited-entry provisions and restrictions employed in contemporary fisheries management frameworks.

Traditional appropriation of marine resources, in some cases, ends up having noticeable effects on fishing pressure and production by establishing normative procedures to control fishery access and activities within socially demarcated sea spaces. Such cultural practices are basically designed to allow fishing communities to intervene in nature and in the life cycles and processes of marine species. In recent years, anthropologists have found this to be an enlightening way to understand and explain why tenure systems develop and how they work in many tropical coastal areas, which, in the past, have been perceived by governments, fishery entrepreneurs and by regulatory agencies alike as open-access areas. The prevailing wisdom behind the imposition of most recent fishery management regimes and legislation stems from what is turning out to be a naive and erroneous assumption about ownership status of inshore fisheries and coastal sea space, much of which has long been held and sustainably managed under pre-existing traditional tenure arrangements. The anthropological and social science literature is now replete with examples of local fishing traditions that intentionally or unintentionally regulate access to resources and sea territory, create fishing rights with corresponding social obligations and that regulate the use and distribution of fishing gear in order to reduce social conflicts and, in certain cases, to control fishing pressure itself. Also as Cordell (2000) points out, sea-tenure traditions may include not only subsistence strategies but reflect basic cultural values, social identity and a sense of place.

An outcome of the traditional appropriation of the marine environment and its natural resources is the establishment of informal sea-tenure systems, through which portions of the sea, including, for instance, submerged rocky grounds are allocated to fishermen families. But, as Cordell (2000) points out, sea-tenure traditions include not only subsistence strategies but are also based on cultural values that are related to the construction and maintenance of a social identity and a sense of place.

The traditional appropriation of marine environment occurs within a broader framework of territoriality through which the artisanal fishermen of the Brazilian coast have marked areas of the sea that 'belong' to them by virtue of their use.

An important element in the relation between traditional populations and nature is the notion of 'territory', which a particular society claims as its own, and grants to all or to a part of its members, stable rights of access, control and use for all or part of the natural resources located there, which they desire or are capable of utilizing (Godelier, 1984). This territory furnishes, first of all, the nature of humans as a species, but also the means of subsistence, the means of production and the means of producing material aspects of social relations, such as kinship relations (Godelier, 1984).

The marine/coastal *territory* depends not only on the type of physical environment exploited, but also on the *social relations* established among those who use it. For many traditional populations that exploit the marine environment, the sea has its *marks* of ownership, generally productive fishing spots, discovered and guarded carefully by artisanal fishermen. These marks can be physical and visible, as it occurs in the *caiçaras* (brush parks) constructed in the lagoon of Mundaú and Manguaba (in Alagoas). They can also be invisible, as in the case of submerged rocks where there is an abundance of fish stocks. These fishing spots are marked and guarded**,** and kept secret through a system of navigation locally called *caminho e cabeço* by the fishermen of the northeast. For members of traditional artisanal fishing communities, the marine territory used is much larger than that of the land, and is more fluid. Despite this, it is conserved by a *lei do respeito* (law of respect) that governs the ethics of the community (Cordell, 1983).

Knowledge of the marine physical environment is extremely important for safe navigation, for the use of appropriate gear and for the identification of certain fish species. Among Brazilian artisanal fishermen, the marine environment is not uniform but is formed by different micro-habitats that

include mangroves, lagoons, estuaries, sand and rocky grounds. Some fish species are known to use different micro-habitats for different purposes, such as feeding, protection and reproduction. In some cases, some micro-habitats must 'rest' when some others are used for fishing (Marques, 2001).

Despite the numerous advantageous uses noted here of artisanal sea-tenure systems, this is not to say they present a panacea for overcoming all fisheries management problems; fishing may become highly competitive and, arguably, as a work setting, it seems to have an inherent tendency to generate conflict. The act of appropriating and controlling access to local sea space and resources by no means renders work environments or the natural environments—even those of small-scale fishing—free of conflict.

9.1 EXAMPLES OF SEA TENURE AND TRADITIONAL MANAGEMENT SCHEMES ON THE BRAZILIAN COAST

Traditional management by artisanal fisheries is closely linked to coastal (lagoons, estuaries, mangrove, etc.) and sea tenures. Sea tenure regulates the access of fishermen to coastal/sea spaces. Traditional management is a set of customary regulations that regulates fishing itself, that is, the amount and type of fish to be caught, with the goal of maintaining the reproduction of natural resources and the fishermen's communities. It is based on a deep knowledge of the physical and biological characteristics of habitats and living resources. There are no written laws but orally transmitted regulations passed from generation to generation. Very often they are loaded with myths and social symbols. The transgression of these regulations is met with social disapproval and loss of respect.

The following are some examples of sea tenure and traditional management:

Caiçara Brush Park

This is a brush park built with mangrove poles in the form of a circle or a rectangle. Inside it the artisanal fishermen lay branches, similar to the *akadjás* of west Africa It is not yet known whether this technique was brought from west Africa by the African slaves or developed locally. *Caiçaras* are mainly used by the fishermen of Mundaú-Manguaba lagoons in the State of Alagoas. They are settled in shallow places with weak water currents. Fishermen have a profound knowledge of the fish species that are caught in the brush parks. The fishermen also have a good perception of the *caiçara* as an artificial habitat created by them. The ecological succession is also noticed: first comes the macroalgae (*cabelo*), then the perifiton (*limo*), the Terrinidae (*buzame*), *Mytella charruana* (*sururu*) and *the Crassostrea rizophorae* (*ostras*). Each stage is associated

with a specific fauna. When the climax is obtained, the fishermen start fishing in the *caiçara* with nets (Marques, 1991).

Summarizing, the *caiçaras* are:

(a) a system of sea tenure: Local fishermen consider the *caiçaras* as their *posse* and territory. Access to the newly created habitat and its resources is determined by the law of respect (*lei do respeito*). As the fishermen say, "We cannot forbid other fishermen to fish in the *caiçaras*, but they respect our place as we respect theirs."

(b) a unit of resources: The fishermen have an idea that the *caiçara* concentrates biomass.

(c) a fish aggregating device: Fish species find a new habitat and a feeding place in the *caiçara*. Local fishermen say that "fish go to the *caiçara* to get protection."

(d) a fisheries management technique: Local fishermen utilize these new habitats in a responsible way, using appropriate nets that catch only adult fish. In a broad sense, the *caiçara* can also be considered an extensive aquaculture technique.

The brush parks of Alagoas State, however, are now suffering from the overall degradation of the Mundaú-Manguaba lagoons. Tonnes of wastes from sugarcane alcohol production are being discharged into the lagoons. The urbanization of the State capital, Maceió, is also responsible for the overall degradation of the estuarine area, and contributes to the disruption of the fishing communities. As local fishermen say, "Outsiders who are not local fishermen lack respect and take fish from our *caiçaras* in the night."

Cercos and *Currais* (Large Fishing Traps)

These are fixed traps built in many estuaries and lagoons all along the Brazilian coast. They were first built by the Indians to catch migratory species such as mullet. They are made of local material such as bamboo poles. They have one entrance that allows only big fish to get in, as the small ones escape through the fence. The owner of the *cerco* rebuilds it every two years when the bamboo poles decay, and when it is abandoned, another fisherman can build his own *cerco*. No other fisherman will dare to take fish from somebody else's trap as long as the law of respect prevails. At present, however, many intruders, mainly recreational fishermen, fish in the *cercos*.

Restricted Access to Fishing Grounds

According to Brazilian law, fishing is open to all fishermen registered in fishermen's guilds (*colonias*). However, in some places, local communities have reserved specific areas for the use of their fishermen. That is the case, for

example, of the Restinga of Pobeba, in Sepetiba Bay near Rio de Janeiro, where traditional fishermen expelled large trawlers that came from outside to fish in their area. Artisanal fishermen used only small nets to catch shrimp and felt that their fishery was being damaged by industrial boats from large companies. Today the area is used only by the traditional community as the trawler owners are afraid of entering into the restricted area and being attacked by the canoes.

The *Caminho e Assento* Fishing of the Northeast

Caminho e assento is a fishing system in which the fishing ground is discovered and pinpointed in the ocean through a complex method of mentally constructed reference points. The fishermen use no compass but still, through crossing imaginary lines (*caminho*), and taking for reference geographical landmarks such as the tops of mountains in the continent, they are able to locate small fishing grounds made of rocky bottoms (*cabeços*) several miles away from the continent. These fishing grounds are 'owned' by the boat captain or skipper who discovered them. Other fishermen do not know where these grounds are located. Some boats might follow the lucky owner of the fishing ground but when the skipper becomes aware of this, he changes the route. After some years, some of these productive fishing grounds might be made public but retain the name of the skipper who discovered them. The secret location of the *cabeços* is handed down by the father to his children.

The *segredo* (secrecy), based on traditional knowledge, is a sign of the authority of skippers over the other fishermen. The more *cabeças* he discovers and keeps secret, the more fish the skipper can land and the more respect he gets within his community. As a fisherman from Galinhos (Rio Grande do Norte) points out, "The sea has plenty of marks that nobody sees." The *caminho e cabeço* demonstrates territoriality, and functions also as a means of controlling the availability of scarce sea resources in the northeast.

Viveiros (Aquaculture Ponds) in the Estuaries

One method to increase fish productivity in the northeast is the construction of *viveiros* in the inner parts of the estuaries. As mentioned earlier, estuarine water bodies belong to the State, but, in some cases, are appropriated by local fishermen through the *viveiros*. They are built by closing of part of the estuary through a barrier of wood and clay. Only one gate is left open during the rising tide, through which salty water enters the enclosed area, also bringing along small fish and shrimps. The *viveiro* is owned by those who build it. The number of *viveiros* has decreased in the region because of the expansion of sugarcane plantations and the increasing pollution by the dumping of alcohol

production waste, as well as due to urban expansion. The *viveiros* are also a type of extensive aquaculture.

9.2 THREATS TO TRADITIONAL MANAGEMENT

In the case of Brazil, traditional sea tenure and fisheries management are only now receiving some attention from scholars, scientists and fisheries managers. One reason for this lack of interest is that vast areas of the Brazil, such as the Amazon and the sea, were treated by powerful industrial and urban elites as 'empty spaces'. The traditional populations of Amazon, particularly the Indians and the riverine populations, were 'invisible' until recently. This 'invisibility' served the ideological purpose of the elites of occupying the Amazon, as only 'uncivilized people' were living there. The same biased view was applied to artisanal fishermen and their communities. When these populations started to react to outsider intrusion, often by force and near-wars, they became 'visible', along with their rich culture and knowledge of ecosystems and management techniques.

Artisanal fisheries today face strong competition from the so-called modern fisheries and from the destructive exploitation of the coast. Local fisheries are being flooded with large industrial boats using inappropriate gear. Social, spatial and technological competition is taking place between locals and outsiders. Since 1967, industrial fishing has been established using tax incentives and suspension of import tariffs on fishery technology. These incentives have benefited mainly industrial groups. The result of this 'fishery modernization' has been widespread destruction of fish habitats, overfishing and marginalization of artisanal fishermen

At the same time, from the 1960s onward, uncontrolled use of land and sea resources reached a critical intensity. Large chemical and petrochemical plants, nuclear power stations, dredging of harbours, oil exploitation, coastal mining and tourism have threatened extensive areas along the Brazilian coast. Urban expansion and tourism have targeted biologically rich habitats such as mangroves, sand barriers and islands. One of the most affected ecosystems are the mangroves, from which an estimated two-thirds of the fish caught in Brazil feed or breed during their life cycles.

In addition to these impacts on artisanal fisheries, there has been a dramatic increase in the demand for fish in the growing urban centres. Fishing has become increasingly selective and some valuable fish species such as shrimp and lobsters were more intensively exploited. When profitability of industrial fishing decreased, most of the industrial fishing crew started exploiting fish resources,

with no respect for existing traditional regulations. In some cases, artisanal fishermen started using the same forbidden fishing gear in order to survive.

In many cases, traditional management techniques have been abandoned as a result of the impact of the activities described earlier as well as because of an increasing disruption of the fishing communities.

Traditional sea tenure is also threatened everywhere, not only by so-called modern activities but also by ill-conceived environmental and aquaculture plans that, in principle, should benefit artisanal fishermen. Government institutions are encouraging aquaculture but very often, traditional extensive aquaculture systems already used by artisanal fishermen are not considered. As a result, in some cases, capital owners and outsiders are the only ones who benefit from these initiatives. The government also promoted the cultivation of species already managed by artisanal fishermen. The adoption of these techniques does not necessarily lead to an improvement in the well-being of local communities. The government, for instance, planned to introduce mullet cultivation through floating nets (*cercos flutuantes*) instead of supporting the existing technique of the traditional *cerco* made of bamboo poles. In fact, floating nets are more capital-intensive and less labour-intensive, and would disrupt the existing social organization. In the end, the new technique was eventually rejected by the artisanal fishermen.

Another threat exists when environmentally protected areas are planned and established. Some of the coastal national parks are being set up in areas traditionally used by artisanal fishermen. The well-conserved areas of the Atlantic Forest and associated coastal system have been used by traditional communities for centuries. Due to their isolation as well as to the existing social structure of these communities, those areas remained well conserved. However, due to existing legislation, the traditional population cannot live in the regions that became protected and have to be transferred to other areas. Highly conflictive situations are being created in almost all protected areas, and local communities resist eviction from their traditional land (as is the case in the Ecological Station of Juréia, the Biological Reserve of Guaraqueçaba, etc.). When eviction of traditional peoples occurs, environmentally protected areas are more easily invaded by commercial fishing and logging interests, and the overall situation becomes even worse.

Instead of using traditional knowledge, some environmental agencies are, in fact, destroying a suitable basis for environmental and social planning. The present situation is gradually changing in favour of traditional communities,

particularly due to the fierce resistance of the traditional peoples of the Amazon. Rubber tappers and Indians succeeded in convincing the federal government to create extractive reserves through which the traditional use of forest products is ensured. Other traditional populations of the coastal areas are now requesting the same treatment to be granted to the rubber tappers. Now the concept of extractive reserve is, by law, applicable to other ecosystems where local population live out of extractive activities, such as oyster and mussel extraction.

10. SOCIAL MOVEMENTS AND INSTITUTIONAL ARRANGEMENTS FOR COASTAL MANAGEMENT

Since the middle of the 1970s, public concern for coastal conservation has gathered momentum in Brazil. Some of the factors that explain this rising concern are:

(a) *The growing awareness of the Brazilian society* of the ecological importance of the coastal area and on the increasing degradation of its ecosystems. The position of the Brazilian government at the Stockholm Conference in 1972 that "Brazil welcomes polluting industries" has changed since then, because of the pressure of NGOs, international institutions and mainly because of the growing awareness of the population concerning environmental issues. In the 1970s, despite the presence of an authoritarian military regime favouring industrialization at any social or ecological cost, many environmental groups were created. In the last years of the military regime (until 1984), national campaigns were organized by environmental movements on issues such as the destruction of the Amazon and Atlantic Forests, the Pantanal, pollution in urban centres (such as São Paulo and Rio de Janeiro), and the establishment of nuclear plants along the coast. Hundreds of small groups blossomed to oppose whale hunting, tree cutting in urban areas and destruction of national parks. Although many of these groups, formed by the middle class, were urban-biased, they were instrumental in raising the level of environmental awareness. They succeeded in electing a few representatives in the State legislatures of the more urbanized States such as São Paulo, Rio de Janeiro and Rio Grande do Sul. In 1986, some candidates with strong environmental concerns were elected to the National Congress that developed the 1988 Constitution. And for the first time, specific considerations of the conservation of coastal ecosystems were included in the Constitution.

In the *Cadastro Nacional de Instituições Ambientalistas–Ecolista*, a roster published by WWF/Mater Natura, there are 1,400 registered environmental NGOs (ENGOs), of which 296 were created in 1991-1992. Around 6O of them, or 14.7 per cent, deal exclusively with coastal/marine ecosystems. If 504 ENGOs dealing with the Atlantic Forest are added, one could say that around 61 per cent of the Brazilian ENGOs are, in one way or another, concerned with the conservation of various marine ecosystems. A large group (30 per cent) is located in the northeast

Of the ENGOs dealing exclusively with coastal/marine ecosystems, there are those some that deal with species or ecosystems conservation, such as

SOS Mata Atlântica (Sao Paulo), Tamar (Bahia), which protects turtles, and Peixe-Boi (for manatee in Pernambuco), Projeto Mamíferos Marinhos da Bahia and Clube de Observadores de Aves (Rio Grande do Norte). There are also socially oriented ENGOs, dealing specifically with traditional populations and their environment, such as Terramar, Sociedade Civil Mamirauá, Sociedade Civil São Sebastião Tem Alma, Fundação Josué de Castro, etc.

A socially oriented environmentalism gained importance vis-a-vis the traditional environmentalism that was interested mainly in species protection. This new environmentalism was able to establish alliances with other social movements, political parties and local movements.

(b) *The increasing number of public institutions* dealing with environment conservation. By the end of the military regime, a public space had been opened for environmental issues. Secretariats for the environment were established in many Brazilian States. At the Federal level, SEMA, the Special Secretariat for the Environment, was created in 1973, and later, in 1992, the Ministry of the Environment was designated as the core agency for environmental protection.

(c) The importance of the environment was also highlighted by a growing number of *university and government research centres*. Well-known oceanographic institutions, such as the Oceanographic Institute of the University of São Paulo, the Undergraduate Course on Oceanography in Rio Grande, Labomar, in Fortaleza, Labohidro in São Luís, and the Schools of Fisheries Engineering in Recife and Fortaleza have contributed to increased knowledge on coastal/ marine ecosystems. Some other research institutions linked to universities, such as NUPAUB- Research Centre on Human Populations and Wetlands of the University of São Paulo, have also co-operated in increasing knowledge about the relationships between local communities and coastal ecosystems. NUPAUB produced the first inventory on the Brazilian wetlands in 1994, disseminating knowledge about coastal habitats and their human population.

10.1 THE ROLE OF THE STATE, NGOS AND LOCAL INSTITUTIONS IN COASTAL MANAGEMENT

Coastal conservation and management became an important issue in Brazil in the late 1970s and 1980s, when the impacts of industrialization and urbanization resulted in rapid degradation of the coastal environment. Artisanal fishermen started a movement in the northeast against the pollution

of estuaries and rivers caused by the acid waste of the alcohol-producing distilleries. It was the starting point for a stronger organization of small-scale fishermen, supported by the Catholic Church and some NGOs. This social process indicated the emergence of new identities and social awareness among coastal communities and artisanal fishermen's communities. These identity-building processes often occurred during conflicts that opposed urban expansion in these communities that often resulted in the expulsion of artisanal fishermen from their beaches and adjacent coastal waters. In tropical countries, where warm, sandy and sunny beaches became valuable assets to national and international tourists, artisanal fishermen and their activities are seen as obstacles to the free development of market forces. Artisanal fishermen and local dwellers are resettled into corners of their own beaches, which are then transformed into tourist resorts. In some other cases, the establishment of large industrialization projects resulted in high levels of marine pollution, and destruction of valuable habitats such as mangrove, and ultimately led to the social disruption of artisanal fishermen communities. In many cases, the social reaction against these processes led to the establishment of new and politically oriented social movements of artisanal people, such as Monape.

10.2 THE BRAZILIAN COASTAL AREA MANAGEMENT PROGRAMME

In the late 1970s, government institutions were created at the federal, State and municipal levels to deal with environment conservation. The first federal institution was SEMA, Secretariat for the Environment, created in 1973 and incorporated by the Ministry of the Environment, and Legal Amazon, created in 1992. In 1989, IBAMA, the Brazilian Institute for the Environment, was created and incorporated in the Ministry of Environment. Since the 1970s, most States have created their own Secretariat for the Environment, and, more recently, many municipalities are creating their own environmental institutions. In 1981, the first comprehensive national law on the environment was promulgated, although the first legislation on environmental issues in Brazil was established in the 1930s. CONAMA, the National Council on the Environment, was created, with the participation of governmental agencies and NGOs, and is responsible for the main policies concerning the environment. In 1986, CONAMA approved the first legislation requiring environmental impact analysis for large projects.

The 1988 Constitution has declared the Atlantic Forest and its coastal zone as one of the five crucial areas for management and sustainable development. The Brazilian government and NGOs actively participated in the 1992 United

Nations Conference on Environment and Development (UNCED-92), in Rio during the various discussions on the issues of coastal/marine environment that produced Chapter 17 of Agenda 21. The text of the Agenda 21 was published in Portuguese in 1995 by the Parliamentarian Commission on Consumer's Protection, Environment and Minorities of the National Congress. According to the text of chapter 17, the Governments have agreed on a series of measures that, if implemented, should lead to the sustainable development of the world's coastal/marine areas.

Also, ENGOs such as the National Forum and Monape have participated in drawing up a Fisheries Treaty, signed by NGOs during UNCED-92. Brazil also signed the United Nations Convention on the Law of the Sea (UNCLOS) in November 1982 and ratified it in December 1988. In January 1993, the Brazilian Congress decreed Law 8.617 by which Brazil defined the 12 miles of its territorial sea and the 200 miles of its exclusive economic zone (EEZ). Since 1988, the Interministerial Commission for Marine Resources has established the Project Leplac to collect geophysical data to define the limits of the Brazilian EEZ. Through the Revizee Project (1994-1998) to assess the sustainable potential of marine resources, the same Commission is surveying the existing biomass and the total allowable catch for each species in the framework of UNCLOS. In the process, the Commission has established research agreements with the main oceanographic and other marine institutions to collect and evaluate the necessary information.

In order to co-ordinate the various research activities on marine resources, the government established, in 1974, the Interministerial Commission for Marine Resources (CIRM). CIRM's main responsibilities are the promotion of research and the rational management of marine resources. The Commission was formed by representatives of eight ministries (Navy, Foreign Relations, Agriculture, Transport, Education, Industry and Commerce, Mines and Energy, and the Interior) and the Planning Office and the National Council for Scientific and Technological Development. In 1979, a Secretariat was established (SECIRM) and was chaired by the Navy.

10.3 COASTAL MARINE PROTECTED AREAS: MARINE EXTRACTIVE RESERVES

The establishment of protected areas is one of the main government policies for coastal ecosystem conservation. The creation of protected areas is under the responsibility of IBAMA and the State Secretariats for the Environment. There are 28 of these protected areas, covering several coastal and marine ecosystems such as coastal and oceanic islands/archipelagos, dunes,

mangroves, lagoons and salt marsh habitats. A recent study on coastal/marine-protected areas has shown that there is a low level of management due to lack of plans, as well as the absence of legislation enforcement, technical and financial means and research.

A major reason for the low conservation achievement, however, lies in the way these protected areas are established, without previous consultation with user groups and traditional populations, in particular. According to existing legislation, these groups must be transferred from the places where the protected areas are to be established. It is known, however, that these traditional communities have been using these ecosystems with a low level of impact on flora and fauna, and should be considered as important allies in the conservation process. As these areas are created mainly by federal and State agencies, local municipalities are excluded from the decisionmaking and, therefore, give little support to these important conservation areas.

In recent years, a new category of protected area was established: the *marine extractivist reserve* through which a marine area is assigned to the exclusive use of a certain number of small-scale fishermen. A management plan is agreed upon by a grassroot institution that assembles the fishermen of the extractivist reserve. Some six marine extractivist reserves have been officially established by the National Council of Traditional Populations (CNPT- IBAMA) and several others are in the process of being created, particularly in the north and northeast regions (Figure 5).

Employing a framework that restricts access to, and economic uses of, coastal sea space offers Brazil a way to begin to control the highly destructive, still basically unmanaged, development of its extensive coastal zone (harbouring a wide range of habitats of high conservation value, not only coral reefs), while, at the same time, reinforcing the resource use rights and territorial claims of local communities to the micro-environments of small-scale fishing.

The marine extractive reserve is essentially an effort to modify and extend the concept of 'extractive reserves', a conservation and sustainable development framework successfully instituted in the western Amazonian forest (primarily rubber) economies, to the coastal aquatic and marine domains of traditional fishing communities (CNPT, 2001; Cunha, 1992; Diegues, 1999, 2001). By taking into account how environment and society both stand to benefit from helping the coastal poor secure continuing access to their traditional sea territories, and livelihood resources, Brazil's marine extractive reserves are a radical departure from conventional approaches to setting up and managing

marine protected areas (MPAs). In the past, most MPAs were established opportunistically, or, more recently, almost solely on the basis of biodiversity criteria.

Figure 5

The marine extractive reserve initiative is exceptionally promising; it has the potential to unify and reconcile elements that all too often are seen as incompatible: traditional cultural heritage and cultural resource preservation needs, sustainable local fisheries, and conservation of marine biological diversity.

Various provisions of national environmental legislation (namely *Lei No.* 9.985/ Article 225 of the Constitution instituting *SNUC, Sistema Nacional de Unidades de Conservação da Natureza, Capitulo III, Art. 14, IV*); civil codes; and international treaties to which Brazil is a signatory (for example, Articles 8j, 10c,10d of the Convention on Biological Diversity) endorse the principles on which collectively held marine extractive reserves are based, along with CNPT's mission (Portaria IBAMA No. 22 / 2-10-92). However, it remains to be seen whether protected areas can be implemented and effectively managed on a scale large enough to have biologically significant impacts. Basic questions remain concerning the social feasibility and economic viability of the marine extractive reserve.

To successfully institute a network of marine extractive reserve sites, CNPT also faces a major challenge in dealing with federal, State and municipal jurisdictional conflicts, inconsistent policies and legislation across sectors, and the need for greater institutional co-ordination and co-operation in managing marine and aquatic resources within the environment sector as a whole (Cordell, 2002).

10.4 LOCAL EXPERIENCES IN COMMUNITY COASTAL MANAGEMENT

While coastal management planning and implementation have, in general, remained technocratic exercises without major impacts, in some areas, coastal communities are doing their own coastal management. In Ceará, for instance, local communities are suffering from the invasion of their beaches by land speculators and tourism interests, and from the overfishing of lobster, mainly by the industrial fleet and by divers coming from a neighbouring state. Assisted by local NGOs and research institutions, they have proposed a Coastal Forum, where the various problems can be discussed by representatives of local communities, the tourism sector, the industrial fisheries sector and the federal, State and municipal governments. Within this forum, they have proposed a management plan for lobster fishing, also in co-ordination with the industrial fisheries sector. When IBAMA announced that no funds and boats were available for surveillance of lobster fishing, the communities equipped one

of their own boats to ensure compliance with the rules that regulate the fishery. Fishermen who disobey the regulations are first reprimanded and when they violate the legislation a second time, they are taken to court.

On some beaches, the sale of a plot of land to tourists must be approved by the community council. In some other coastal communities, such as Pirajubaé in Santa Catarina, Mandira-Cananéia in São Paulo and Arraial do Cabo in Rio de Janeiro, extractivist reserves are being built in order to ensure access to fisheries resources for the members, and limit access to outsiders, especially sport fishermen. In most of the communities' initiatives, there is a strong resource-conservation component, and, as result, they frequently succeed in getting the support of government and non-government environmental organizations.

11. FINAL CONSIDERATIONS: THE NEED FOR ALTERNATIVE POLICIES AND STRATEGIES

One of the most serious constraints for the sustainable development of small-scale fisheries is the absence of government policies for the whole fishing sector. The only attempt to evolve a strategy for the development of the artisanal fisheries sector was done by SUDEPE, through the PESCART, the assistance programme for artisanal fishing, established in 1973.

What has characterized SUDEPE in the last 20 years (1967-87) in relation to fishing policy is the priority given to the industrial/corporate sector, with a policy of fiscal incentives established by Decree 221 in 1967. Undermining the importance of the artisanal sector, SUDEPE opted for the establishment and strengthening of fishing companies with businessmen who frequently did not belong to the fisheries sector. This model, which was capital- and technology-intensive, had mediocre results, and led to the overfishing of the limited tropical fish resources.

Between 1973 and 1988, artisanal fishing received only 12 per cent of the equivalent funds invested in industrial fishing through fiscal incentives and ended up, to a large extent, reduced to being a mere supplier, be it of cheap labour or of fish production for the fishing companies.

The focus of PESCART was 'technical assistance' provided by fisheries engineers, the majority of whom narrowed the term 'development' to mean new capture and processing techniques. Although limited in scope and results, PESCART was the only small-scale fisheries programme and was discontinued when SUDEPE ended its operation in 1988, when its responsibilities were handed over to IBAMA. This environmental institution was preoccupied only with fisheries regulations and law reinforcement, leaving aside any strategy related to sustainable fisheries development and the well-being of fishermen.

One of the few attempts on the part of IBAMA to support artisanal fishing was the organization of extractive reserves in mangrove forests and estuaries for the exclusive use of the artisanal fishworkers. But again, there is no clear policy and funding strategies for the operation of these important extractive reserves.

In 1998, a Fisheries Department was created under the Ministry of Agriculture, but its main concern has been with the leasing of foreign boats for industrial tuna fishing and not with artisanal fisheries. This lack of policy for small-scale fisheries is part of the general neoliberal economic policy of the

government, through which the market is expected to solve all social and economic problems.

In spite of the worsening of the economic and social problems of the fishworker communities, the following positive signs have been noticed in some States:

- The creation of departments to promote fishing by the provincial and municipal governments, thus creating structures more flexible to solve problems at local levels.
- The initiatives, although spread out, of some NGOs to organize the artisanal fishworkers.
- The movement of the Constituinte da Pesca and the creation of MONAPE have mobilized Brazil's artisanal fishworkers around common issues.
- Some States have succeeded in the organization of free elections for posts in the administrative council of the fishworker *colonias*. These new councils, free from the influence of individuals not belonging to the sector, need technical and financial support to design and implement programmes to promote artisanal fishing and achieve concrete results in bettering the situation of the fishworkers.

Keeping this in mind, it is necessary to create options that address the local situation, within the range of the possible use of resources, technology and organizational forms, keeping in mind the following four criteria:

- social criteria for the distribution of incomes
- ecological sustainability
- effective use of energy
- economic viability

In Brazil's present situation, keeping in mind the obstacles in the development of sustainable artisanal fishing described above, alternative strategies should be based on:

(1) the creation and the strengthening of new forms of associations of fishworkers, free from the patronage of the government and its institutions, like the Ministries of Agriculture, Marine Resources etc.) These associations (guilds, unions, etc.) must have their councils elected freely, at the local, municipal, State or national level.

(2) support to civil associations, such as NGOs, MONAPE and Pastoral da Pesca as well as to new initiatives such as extractive reserves, local tourism in fishworker communities etc.

(3) an effort towards the social mobilization of the fishworker communities, with the objective of regaining confidence in themselves as agents of development. One of the objectives of this mobilization is the creation of new leaderships substituting the traditional roles, many a time exercised by people who are outside the sector, such as traders, councillors, etc.

(4) the expansion and reinforcement of marine extractive reserves as the core of a new strategy to free artisanal fisheries areas from incursion by industrial boats and real-estate speculators.

(5) the need to integrate traditional knowledge and management into contemporary management systems. This integration will foster the actual participation of fishermen in the planning and implementation of the extractive reserves. Traditional knowledge, associated with scientific methods, could be a sound basis for local fisheries management.

(6) a new conception of integrated projects that respects the complementation of the diverse economic activities carried out by the fishworkers (agriculture, fishing and artisanal extraction, etc.) Thus, the projects in areas where traditional complementary relations are maintained will ensure that the fishers are not solely dependent on fishing. Some experiences in Ceará and São Paulo show that a co-existence between fisheries and local tourism initiatives may be successful.

(7) a new conceptualization of 'technological innovation', which is not restricted to fish harvesting, an increase of which can lead to overfishing, but also to the whole range of activities related to production, processing and marketing. These innovations must not only be technologically viable, but must also ensure positive results for all artisanal fishworkers and not only for the middlemen.

(8) the real participation of fishworkers in the regulation of the use of natural resources (fish, mangrove vegetation, etc.) The fines imposed on the damaging parties must be included to benefit the integrated programmes for resource management controlled by the communities.

(9) marketing systems that involve the substitution of the middlemen, starting from an analysis of the traditional patronage role they play. Complex marketing systems should be avoided, such as vertically organized co-operatives. As and

when possible, direct marketing should be encouraged, above all in communities close to tourist facilities.

(10) priority for activities strongly linked to fishing, such as mariculture on the coasts. This, especially in the initial stages, must not be a specialized activity and must be developed to supplement the income from fishing within the local environment. Experiences such as the Mandira oyster management project in Cananéia, shows that the establishment of extractive reserves can be an important strategy both for production and commercialization in coastal artisanal communities.

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This study deals with the challenges facing the development of artisanal fisheries in Brazil. The problems affecting production in the sector are worsening, due as much to objective factors like environmental degradation and the destruction of natural resources as to the ineffectiveness of government strategy. The result is a lack of sustained development of the sector and a stagnation in the living conditions of the fishworker communities. Besides attempting an analysis of the situation of artisanal fisheries in Brazil, this study puts forth some alternative strategies for the development of the sector. It will be found useful by NGOs, regional and national organizations of artisanal fishworkers, and anyone interested in fisheries and fishing communities.

ICSF is an international NGO working on issues that concern fishworkers the world over. It is in status with the Economic and Social Council of the UN and is on ILO's Special List of Non-Governmental International Organizations. It also has Liaison Status with FAO. Registered in Geneva, ICSF has offices in Chennai, India, and Brussels, Belgium. As a global network of community organizers, teachers, technicians, researchers and scientists, ICSF's activities encompass monitoring and research, exchange and training, campaigns and action, as well as communications.

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