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BIOLOGICAL DIVERSITY AND TRADITIONAL CULTURES IN
COASTAL WETLANDS OF BRAZIL

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1. INTRODUCTION

This case study is part of the IUCN Project on Economic Incentives for Biological Diversity. It aims to illustrate how economic incentives can be used to help conserve biological diversity. The case study area covers the coastal regions of Sao Paulo, Rio de Janeiro and Parana States. Examples will be taken from the Picinguaba Conservation Project (SP) and Iguape-Paranagua estuarine ecosystems in Sao Paulo coast (see map 1).

In addition to considering the role of economic incentives/disincentives in the conservation of natural diversity, particular attention is focused upon how cultural diversity contributes to the conservation of coastal ecosystems. By so doing this paper considers the role of economic incentives in a more global framework of Third World Societies. It argues that in those societies, the maintenance of existing cultural diversity is an important condition for the conservation of biological diversity. Reciprocally the conservation of natural habitats is an essential condition for the maintenance of culturally rich traditional cultures.

This emphasis upon cultural patterns and modes of production as elements to consider in conserving biological diversity is of fundamental importance for Third World countries. In these countries, economic incentives which do not take due account of these traditional cultures may make only a limited contribution to conserving biological diversity. Only if these incentives are developed within the overall cultural context, will they be successful. The thesis of this paper is therefore that understanding of the economic, social and cultural mechanisms is essential to understand how economic incentives for biological diversity conservation may work.

In many developing countries, natural ecosystems support the rural economy. They provide income and food resources for peasant and fishermen communities which have developed a close and culturally defined relationship with their environment. In many such situations cultural values and religious beliefs have a strong conservation function (Bourgoignie, 1972). Fish spawning areas, and breeding habitats for bird and other wildlife are often traditionally protected by cultural or religious controls.

Coastal Management Strategies in Brazil

Traditional fishermen along the Brazilian coast have an acute empirical knowledge about fishing grounds far from the coast and their secret, not transferable to outsiders, has a conservation function (Forman, 1970; Cordell, 1983). In addition, a series of traditional fisheries management schemes exist. These management schemes are based on traditional techniques which coastal populations use in order to improve fish production without damaging the resource base. Some of these schemes are based on techniques adapted to specific coastal habitats. Examples of these schemes are:

- a) "Bush park" (caiçara). This is used by artisanal fishermen in the Mundau and Manguaba lagoons (Alagoas) as an extensive fish-farming device. It is similar to the bush park akaja system used in some

lagoons of West Africa. It consists of laying branches of trees in well chosen places in order to attract fish that will grow and feed on algae and phytoplankton growing on the bush park. After some time, the fishermen take the grown fish for food, leaving the juveniles.

- b) "Viveiros" (estuarine ponds). This is a type of dam that closes small channels in the estuaries. During ebb tide juveniles and fishes pass through an open gate and are kept inside during the pond in the low tide. After the screen gate is closed, only the estuarine mixed water passes, bringing oxygen and nutrients to the dam.
- c) Communal sea space control: In some traditional coastal fishing communities access to the best fishing spots is regulated either by the secrecy kept by the captains or by loose communal arrangements. Although the water space close to the communities is public by law, in practice the access to the resources close to the villages is controlled by fishermen guilds or by the community. Forman (1970) has described how the fishing grounds are found by experienced captains and kept under secrecy. This prevents close competition and contributes to management of the resource. Cordell (1983) has also described how fishermen adjust the fishing areas according to season and tide cycle and how use of these is controlled by canoe bosses who exercise control.

Modern management schemes in Brazil have been devised taking into consideration the fishing techniques used by the modern industrial fleet. Very little is done to solve the severe conflicts that already exist between artisanal fishermen and the industrial fleet. It is essential to protect artisanal fisheries from the invasion of the industrial fleet. The traditional management schemes could constitute a basis to prevent that invasion and the conflicts. In order to assist this, these management schemes should be better studied and assessed on the basis of their potential applicability to the management of small-scale fisheries.

Along the Brazilian coast biological diversity has been maintained because of the traditional relationship between the small producers' society and their environment. However, in recent years, disruptive contact with the market-oriented economy, the increasing coastal degradation and pollution, and the penetration of urban culture, have led to an increasing disruption of these traditional cultures and societies (Diegues, 1983). These factors have caused a decrease in the primary productivity of rich ecosystems and the impoverishment of traditional communities that lived from their renewable resources. The central point of this paper is that an overall policy of environment protection and conservation has to take into consideration the survival of culturally diversified traditional communities and their habitats.

This case study is based on the analysis of one of the traditional coastal cultures now under stress: the "caiçara culture" of the coastal communities of Sao Paulo, Parana and Rio de Janeiro States.

2. THE CAIÇARA CULTURE AND THE NATURAL ENVIRONMENT

2.1. The history of the caiçara settlements

"Caiçara" is a common name for those human communities that live along the coast of Sao Paulo, Parana and Rio de Janeiro States and have a particular way of living that differentiates them from the "caipiras" peasants from the hinterland.

This population lives in small towns and villages along the coast, combining agriculture, fishing and fruit gathering from the Atlantic Forest. This particular population has been formed by a mixing of the indian and Portuguese cultures, and has also been influenced by the African culture.

In the pre-colonial times, this area of Brazil was inhabited by different indian tribes that practiced both subsistence agriculture, hunting and fishing. The "caiçara" population still uses fishing, cultivation, medicine and food preparation techniques taken from those indians. Although most of the indian tribes have been destroyed by the colonisers, a few accultured indians still exist along the coast.

The oldest human settlements established by the Portuguese in the 16th and 17th centuries, such as Iguape, Cananeia, S. Sebastiao, Ubatuba, Antonina and Paraty, were established in the "caiçaras" area. These towns played a very important economic role during the colonial period as exporting centers for gold, rice and sugar cane. The decline of these rich towns started in the middle of the 19th century and was caused by the emergence of a new economic cycle based on coffee production in the hinterland, far from the coastal zone.

After the economic decay of the coastal area, the "caiçara" settlements and towns became isolated from the more developed hinterland. Although linked to small regional centers, such as Iguape and Ubatuba (SP), the small coastal settlements survived on the basis of a subsistence oriented economy.

At present, it is difficult to assess how many "caiçaras" communities and population exist along the coast. According to Sudelpa (Superintendency for the Development of Sao Paulo coast, 1985) there are around 92 small caiçaras settlements in the area of Iguape-Cananeia estuary (see map 1).

According to the Confederation of Artisanal Fishermen there are around 95,000 part-time and full-time artisanal fishermen in the States of S. Paulo, Rio de Janeiro and Parana. A significant part of these fishermen belong to the "caiçara" population.

2.2. Biological diversity in the "caiçara" territory

The "caiçaras" occupy a variety of coastal habitats. These include:

- a) ecosystem of the Atlantic Forest,
- b) Sand barrier islands, beaches and dunes,
- c) coastal and oceanic ecosystems.

2.2.1. The Atlantic Forest ecosystem

This is a common denomination for a group of forests that covers areas from the far north to Rio Grande do Sul (see map). This forest is rather well conserved, specially in the mountainous areas, some of them close to the sea.

Some authors consider the Atlantic Forest as the most outstanding geomorphological feature of the south-west Atlantic (Ab Saber, 1962). The mountainous chain retains the humidity brought by the oceanic air masses, and the rainfall is high.

These climatic conditions associated with the topography, soil characteristics, and geomorphology, have favoured development of an exceptionally rich flora. The Atlantic Forest is particularly rich in arboreous and epiphyte species, and the degree of diversity is considered to be similar to the Amazon Forest (Silva, 1980).

Due to degradation since the colonial times, this biological diversity has been reduced. A secondary vegetation is now predominant in most parts.

Many plants are utilised by the "caiçaras" for house construction, domestic utensils, fishing equipment, boat building, medicine, etc. Most of these species are concentrated in the lower part of the forest. The wood utilised by these traditional communities has a short life-cycle. They have also introduced exotic species, such as banana trees, cassava, sugar cane in their small cultivation fields.

The most common species are the following:

Trees: Crecoxia glaziovi (umbauba), Calyptantes sp (araçarana), Astrocaaryum aculeatissimum (brejauba), Aspidosperma compactinervium (peroba), Vernonia discolor (cambara-guacu), Ocotea sp (canela).

Some of these species are utilised by the caiçaras for different purposes such as food: Myrcia sp (araçarana), Euterpe edulis (palmito), medicine: Cariniana estrellensis (jequitiba branco), wood construction: Aspidosperma compactinervium (peroba), Attalea dubia (palmeira indaiá), Astrocaaryum aculeatissimum (brejauba), Syagrus pseudococos (pati), Euterpe edulis (palmito); craftsmanship: Mabea brasiliensis (canudo do pito), Cariniana estrellensis (jequitibá branco); boat building: Malouetia arborea (guerana), Shizolobium parahybum (guapuruvu); fishing traps: Jacaranda semisserrata (caroba), Qualea gestasiana (canaiba), Tibouchina sp (manacá da serra), Chrysophyllillum viride (caxeta amarela).

There is also an important diversity of birds and mammals in the forest (Table 1), many of which are hunted by the local communities (*).

Mammals

Didelphis marsupialis* (gamba)
Cebus nigritus (mico)
Cebus apella* (macaco prego)
Nasua solitaria* (quati)
Tayra barbara* (Irrara)
Lutra platensis* (lontra)

Birds

Tinamus solitarius* (macuco)
Crypturellus notivagus
notivagus* (nhambu)
Pipile jacutinga* (jacutinga)
Ara chloroptera* (arara)
Amazona brasiliensis* (papagaio)

Coendu villosus* (ouriço)
 cuniculus paca* (paca)
 Bradipus tridactylus (preguiça)
 Dasypus novencinctus* (tatu galinha)

Ramphastus vilelinus (tucano)
 Furnarius rufus (joao de barro)
 Turdus albicollis* (sabiá)

2.2.2. Sand Bar Islands, Beaches and Dunes .

These ecosystems are formed by deposits of sand that originate from movements of transgression and regression in the Quaternary period.

The vegetation of these ecosystems has an important diversity. The vegetation of the sand bar islands present well-defined zones and the diversification of species is higher behind the beaches. Along the beaches herbaceous species are predominant. Behind the dunes, there are swampy areas where many species of birds nest.

Because of the natural beauty of these habitats, they are currently under heavy pressure from modern tourism and land speculation. In particular on Ilha Comprida, a long sand bar island in the southern coast of Sao Paulo, more than 300,000 plots of land have been sold for house construction. This is far in excess of the carrying capacity of the island.

The "caiçaras" used to build their thatched roof houses and small villages in these beach habitats. They utilise wood for house construction and fishing equipment, such as Babeuia cassinoides-caxeta. Some species have food value, such as Eugenia sp-pitanga and Myrcia sp (araçá).

A list of plants found in those ecosystems is found in the appendix.

2.2.3. Mangrove Ecosystems

Mangrove ecosystems, located in estuaries, lagoons and river mouths are extremely important in the area. In the south of Sao Paulo the Iguape-Cananea lagoon complex contains some 600 sq. km. of mangrove. There are more than 12 species of mangrove in the area and the more important are: Rhizophora mangle (mangue mermelho); Languncularia racemosa (mangue manso) and Avicennia tormentosa (seriuba). Other plant species associated with the mangroves include Conocarpus erecta, Hibiscus tiliaceus and Acrosticum aureum.

Fish are perhaps the most important resource of the mangrove areas. The most common species are: Centropomus sp (robalos), Diapterus tombeus (carapebas), Mugil brasiliensis (tainhas), Cynoscion leiarchus (pescada branca), Cynoscion microlepidotus (pescada amarela), Micropogon opercularis (corvina), Scomberomorus cavalla (cavala), Tachysurus luniscutis (bagre amarelo), etc.

Among the crustaceans, the most important are: Cadisoma guanhum (caranguejo guaiamum), Ucides cordatus (carangueijouçá), Penaeus brasiliensis (camarao rosa), Penaeus paulensis (camarao rosa), Penaeus schmitti (camarao branco), Callinectes bocourti (siri), and among the molluscs: Mytilus edulis (marisco), Mytella falcata (sururu), Crassostrea brasiliensis (ostra), Tagellus gibbus (unha de velha).

Birds of the mangroves include: Amazonetta brasiliensis (marreca-ananai), Larus marinus dominicanus (gaivota), Phaetusa simplex (andorinha do mar), Sterna superciliaris (trinta reis), Ardea cocoi (garça parda), Egretta thula thula (garça branca), Nycticorax nycticorax (socó), Ajaia ajaja (colhereiro), Ceryle torquata (martim-pescador), Aramides cajanea (saracura do brejo), Porphyryla martinica (frango d'água azul).

Mangrove areas are utilised by the traditional population primarily as a source of food. Bark is also utilised for tanning and wood is used for construction.

The mangrove vegetation is being destroyed in the area through land reclamation, house construction, mining, industrial and oil pollution. In the estuary of Iguape-Paranagua large areas of mangrove are still preserved and constitute the most important habitat of the estuary for the local community. It is also directly responsible for the natural productivity of the adjacent sea.

2.2.4. Lagoons and Estuaries

There are many estuaries and lagoons in the low coastal plains of the south of Sao Paulo and Parana and Rio de Janeiro (Map 1). The main one is the large Iguape-Cananeia-Paranagua estuary, which is more than 200 km long. It has extensive tidal rivers, flood plains, beaches, mangrove and sandy barrier habitats.

The State of Rio de Janeiro is known for its lagoons and estuaries such as Sepitiba, Marica, Araruama. It is the most important ecosystem used by the caiçara population for fishing activities. The flora and fauna of these ecosystems are those existing in the mangrove, sandy barrier island and beaches.

2.2.5. Coastal and Ocean Ecosystems

The "caiçaras" also exploit the open sea, close to estuaries and beaches. In the rocky northern coast of Sao Paulo the local fishermen use the coastal area for fishing, although in their small canoes they do not go very far into the ocean. In the south, only few artisanal fishermen exploit the open sea with motor boats, particularly for shrimp fishing.

2.2.6. Protected Areas

A series of protected areas have been created along the coast (Map 1). These include the State Park of Ilha do Cardoso, Jacupiranga, Ecological Station of Jureia-Itatins, Atlantic Forest and Ilha Comprida (Sao Paulo). In the State of Parana there is the protected area of Guaraqueçaba. In Rio de Janeiro there are also many protected areas such as Serra da Bocaina, Tamoiós, Itaguatiara, etc.

In most of these protected areas there are serious problems caused by invasion of logging firms, mining interests and pollution.

2.3. The traditional use of the coastal ecosystems by the "caiçaras"

Until the sixties, the main activities of the traditional coastal population was subsistence agriculture combined with small-scale fisheries and gathering of fruit in the forest. Using a slash and burn system, they

cultivated cassava, some rice, sugar cane and fruit trees, with the help of the family labour. For harvesting the rice the caiçaras worked as a community using communal work locally known as "mutirao".

Fishing, as well as agriculture was divided in two main seasons: the summer, from November to April, and the winter, from June to September. The mullet fishing played a particularly important role in the "caiçara" society until the sixties, and is still today important in the more isolated communities. Mullet was the main source of animal protein and the whole community was organised to exploit this. The fish were caught by the use of beach seine and bamboo screen traps (cercos), and were dried and salted to be sold or exchanged with other goods in town. Today however the industrial fleet in the south has expanded and the population has declined.

In addition to fisheries and small-scale agriculture, the "caiçaras" used the forest products for building canoes, medicine, construction material. Additional animal protein was obtained through hunting. This was done only during certain periods of the year.

Understanding of tidal movements was critical to the success of fishing. This indicated the time for laying the nets, taking the fish from the traps, etc. The lunar cycle was also respected when it came to cutting the trees for making dug-out canoes. The physical and biological cycles also influenced myths and religious behaviour. Certain religious festivals were organised only after the main fishing season.

Another characteristic of the "caiçara" society was social equality. As the economy was based mainly on subsistence structure, with reduced surplus, there was no defined class structure. The community was poor and homogeneous, and social cooperation inside the village was high.

The cultural patrimony of the caiçaras now under threat of disparition is one of the richest in the whole country. They kept old traditions from the colonial period. At the same time they have developed their own festivals and rituals related to the communal work in the fields, and in the fisheries. Their culture is also closely linked to the coastal zone and to the marine environment upon which they depend.

The cultural richness was based primarily on a wise use of the natural resources and respect of the natural cycles. As the population density was small and their techniques were energy saving, their economic activities had little impact on the environment and their resources.

3. ECONOMIC, SOCIO-CULTURAL AND ENVIRONMENTAL CHANGES IN THE CAICARA PART-SOCIETY

The above described socio-cultural situation started changing from the fifties and sixties. Commercial fishing based on shrimp catch in the south and industrial sardine fishing in the northern coast was developed. In the Cananeia-Iguape region (Map 1) fishermen from other southern States, using motor boats, started fishing for shrimp outside the estuary. The traditional local fishermen continued fishing inside the estuary, using simple techniques. Some few "caiçaras" were able to buy motorised canoes and went fishing outside the lagoon. In the northern area, larger purse-seiners from Rio de Janeiro and Santos began sardine fishing for industrial purposes.

At the same time roads were built linking the old coastal towns to the fast growing centers such as Rio de Janeiro and Sao Paulo.

In the sixties a strong demand was created for highly valuable fish from the coastal areas, especially for shrimp and oyster. A few "caiçaras" were able to benefit from this business, as they bought motor boats. As this happened their dependence upon the urban based fish traders became stronger as they controlled the fish market. They also financed new equipment such as nylon nets and engines. Given the market pressure, outside trawlers started fishing close to the lagoon in Cananeia and inside the bays in the northern coast, competing with local fishermen. Traditional fishing spots of the local population were invaded by outside trawlers, causing many conflicts, where the poorer caiçaras were the losers.

Since the sixties tourism and land speculation have also exerted strong pressure over local communities, particularly in Ubatuba, Paraty and Iguape. Many "caiçaras" have lost their land or are physically driven out of their ancestors' beaches. Their thatched roof houses and huts to keep fishing equipment have been burned by "jagunços" - bandits paid by land development companies.

Only distant caiçara communities situated far from the main roads are able to resist the assault of the tourists and land "developers", and continue to live in the traditional way. In those communities the peasants/fishermen still use a variety of fishing techniques exploiting a variety of habitats inland and on the sea.

In more recent years several State parks and reserves were created in the caiçara territory (Map 1) in order to protect important ecosystems such as the Atlantic Forest, and mangrove resources. One example is the State park of the Ilha do Cardoso, on the southern coast of Sao Paulo. In this large island, dozens of families of "caiçaras" were forbidden to practice their traditional way of living as the park was created. As a consequence, unable to make their traditional living, those families were forced to leave the island or were deprived from their cultivation fields. The same thing happens in the State park of Jacupiranga, although mining and logging enterprises continue to operate in the protected area.

The social and cultural life of the "caiçaras" is being disrupted. Deprived of their land, many communities lost access to the beach and fishing became difficult. Many local people were forced then to move to

town where they live in poor slum areas, under-employed or unemployed. Others, although living on their beaches are employed as non-qualified workers in the construction industry or take care of the houses of tourists. The previous social cohesion and homogeneity is disappearing. Social marginality is now common in the area. The "caiçaras" more exposed to these disruptive processes are now using predatory practices over the living resources that before were used with respect. Living at the edge of survival, they are cutting mangrove roots to take young oysters which are sold in the market and harvesting "palmito" (edible heart of palm tree).

As a result of the disruption of their mode of production their rich culture is being abandoned. Urban habits and values invade the traditional beaches. Traditional craftsmanship such as canoe making, sail cutting, medicine prepared from forest herbs, making of musical instruments and traditional songs and festivals are being lost.

4. THE NEGATIVE ROLE OF STATE INCENTIVES

Since the sixties the Government is providing fiscal incentives for companies which exploit renewable resources. Two main sectors receive fiscal incentives: fisheries and forestry.

a) Incentives for Fisheries. In 1967, SUDEPE (Superintendency for Fisheries Development) provided large amounts of capital investment for industrial fisheries. These funds were made available for existing or new firms from deductions of income taxes of individuals or companies. From 1967 to 1973 more than 100M US\$ were provided to firms at very low interest rates, but only to firms servicing the export market. Artisanal fisheries which contributed more than 50% of the fisheries catch did not receive any incentives. The results of this policy are as follows (Diegues, 1983):

1. High pressure over the fish stocks and overfishing of the main species: lobster, shrimp, cat fish. The industrial fleet from the rich southern States, after destroying the stocks in the area moved to the productive areas of the Amazon basin, repeating the same overfishing.
2. Many firms, after receiving the funds, have not invested in fisheries but went into speculation. Many firms are now bankrupt.
3. The artisanal sector, although not receiving the fiscal incentives, are still responsible for a large proportion of the fish catch.

b) Incentives for reforestation: IBDF (Institute for Forestry Development) has given huge amounts of funds for reforestation firms. As a result, thousands of hectares of primary forest were cut and replaced by Eucalyptus or Pinus.

In both cases these centralised economic incentives have resulted in the reduction of biological diversity and led to the impoverishment of fishermen and peasants.

Although efforts have been made to reduce environmental destruction, the policy of the Government is to create national forest parks, marine parks, biological stations, etc. Paradoxically, the first step to establish these protected areas is to drive out traditional communities. Habitats prized as potential parks, faunal reserves or buffers against "development" are often ancestral land or subsistence territories of local cultures (Cordel, 1983). In many cases, these areas are sparsely populated by traditional communities which live in a sound relationship with the natural environment. These ecosystems are traditionally seen as community territories. Very often the access to these resources is controlled by local dwellers. When outsiders intend to use those natural resources they have to contact local communities or be related to them through the traditional system of godfatherhood. As parks are created, those communities are driven out. These protected areas are seen as nobody's land and as surveillance is lacking, the destruction of these habitats by commercial interests is even worse than before. Knowing well the forest, the now impoverished local dwellers are used by companies to extract all kind of products from the protected areas.

These and other similar policies of the Brazilian government are resulting in both a rapid degradation of rich ecosystems (Diegues, 1987) and a reduction in cultural diversity along the coast. What is happening to the "caiçaras" is also affecting traditional coastal cultures such as "jangadeiros" (raft fishermen) in the north-east, the "ribeirinhos" (river bank small producers) of the Amazon river, indians of the northern region, "açorianos" from the south, etc. Given this dramatic situation, conservation policy has to change to incorporate the traditional communities as an essential part of a new conservation strategy.

5. PILOT PROJECTS ON COASTAL ECOSYSTEMS CONSERVATION

In recent years there have been some indications that protected area policy in Brazil may be changing. Two projects illustrate this, the Picinguaba project in the northern coast of Sao Paulo and the integrated development project for Iguape-Cananeia-Paranagua project at the southern border of Sao Paulo and Parana States.

5.1. The Picinguaba pilot project

In 1979 Sao Paulo State Government added 10,000 ha to the already existing State Park of Serra do Mar. Five beaches of "caiçara" villages were included in the protected area. Instead of displacing these traditional communities the Government decided to start a conservation project with the participation of "caiçaras" and indians.

The project intends to manage the protected area in order to achieve the objectives of environmental conservation, support to the caiçara and indian cultures, as well as ecological research and education. It also aims at studying the enormous richness of the fauna and flora of the Atlantic Forest. At the same time it aims at improving the living conditions of local communities, and supporting economic activities compatible with the natural vocation of the ecosystems such as mariculture. Through a set of activities such as handicraft, fishing and mariculture the project intends to reduce migration of the caiçaras to the cities. At the same time it aims at raising interest from urban tourists for the local culture and traditions through environmental education and research.

The location of the project area between two State parks is strategic and the fishing village of Picinguaba has a long artisanal fishing tradition. The other settlements called Fazenda da Caixa and Ubatumirim are located in beaches with a large flat area behind which is used for manioc, and sugar cane cultivation. The caiçaras living there combine small-scale agriculture and seasonal fishing. Traditionally they use to exchange manioca flour with fish caught by the "caiçaras" from Picinguaba. However, this economic exchange was disappearing because the villagers from Ubatumirim and Fazenda da Caixa did not have the financial means to rebuild the traditional manioc flour workshop. This workshop (casa de farinha) uses a traditional technology for grinding and preparing the flour. A water-moved wheel is used to move the grinder and to prepare the flour.

The project started in 1985, and in 1986 decided to rebuild the traditional "casa da farinha" and asked old "caiçaras" to make artisanally the machinery from local wood. These "caiçaras" are the same who built the last manioc flour workshop in the 1950s. The construction of the plant lasted almost one year and it is already producing the important staple food of the "caiçara": the manioc flour. Some fifteen tons have already been produced. The payment for the use of the plant is the traditional one: 50% of the flour goes to the producer and 50% is kept to pay the "caiçaras" who work in a very time consuming activity. When the producers prepare the flour themselves they only pay the maintenance fee, which is around 10% of the flour produced. The "caiçaras" now plan to organise a small cooperative of producers in order to run the plant.

At the same time the project plans to rebuild the old artisanal sugar cane plant in order to produce molasses which is traditionally used to sweeten coffee drinks. Facilities are being built in the same place where an old plantation existed more than 100 years ago, using local material and following local architecture. A small research center with accommodation for 32 researchers, a cultural center for local indians, a naval museum and facilities for environmental education are being built in the protected area, close to the beach.

The "caiçara" families already living in the area were given the choice of leaving the area, after compensation for their properties or integration in the project. Those families that decided to stay in the protected area agreed that they would not clear additional land for subsistence agriculture. In compensation they could be trained in other activities such as mussel cultivation, park administration, etc.

Some families live on handicraft which is made out of forest wood. Although wood cutting is forbidden in the park by law, arrangements are being made in order to provide them with wood so that they can continue with their traditional activities. The project is already attracting outside visitors visiting the cassava flour plant and the park area. They can also participate in the various festivals of the "caiçara" culture.

5.2. The integrated development project for the Iguape-Cananeia-Paranaguá estuarine region

In 1985, Sao Paulo and Parana governments identified this estuarine area that borders the two States as an important ecosystem to be protected for the benefit of the "caiçara" communities. Priorities are set out for food production, recreation, and wildlife conservation.

The two States have signed an agreement that makes provision for: environment protection through resource assessment; reinforcement of protection measures for the existing parks; conservation of natural resources through wise use; land use regulations; improved management of marine resources; support for economic activities in line with the natural vocation of the ecosystem, such as mariculture; improvement of health and sanitation services; integrated ecosystem research and environmental education.

The core of the project is a global coastal management plan that indicates areas for specific activities (conservation, intensive and extensive resource use). This is now under way, funded by CIRM, the Interministerial Commission for Sea Resources. In preparing the plan, conflictive uses will be resolved by a Coastal Committee formed by representatives of government institutions, fishermen and peasant associations, entrepreneurs, environmental groups, etc.

A first management plan was completed in 1986 for Ilha Comprida, a sand barrier island under threat by intensive tourism. Priority has been given to land use control, conservation of mangrove, of fishermen villages and mariculture. The major threat now is the construction of a bridge which would lead to uncontrolled access to the island. Before a more intensive influx of tourists and construction starts, the management plan has to be implemented.

In addition to the priority given to reinforcement measures for State Parks, the programme of sustainable development has initiated a set of economic projects aiming at ameliorating the living conditions of the local population. These projects intend to use a variety of renewable resources of the estuarine area within the framework provided by the traditional economic system based on a mixture of agriculture, fishing, and other activities. These projects are designed to avoid an overuse of a specific resource which might cause an imbalance in the ecosystem.

Some examples of these projects are:

1. Oysterculture, combined with small-scale agriculture and fishing.

As the mangrove oysters from Cananea are being depleted, the Secretary for Environment of Sao Paulo and the Fisheries Institute are starting a project of oysterculture, on a community basis. The know-how is already available through years of biological research undertaken by the Institute. Two communities have been selected for pilot projects. There is no intention to transform small-scale fishermen/peasants into full-time oysterproducers. Oyster cultivation will be one additional source of income for those small-producers. In the long-term a more specialised group of oysterproducers may appear. Economic incentives will be used to maintain the complementarity of traditional economic activities. Subsidies will be used for transportation of agricultural, fishing and oyster-production.

2. Processing of local products.

Some projects are being undertaken in order to increase the local profit from local products such as fish and agricultural products. Fish smoking is a technique which is being introduced in the area in order to increase the value of fish resources. The idea is to increase the income of fishermen without a higher fishing effort, thus reducing pressure upon the resource base.

3. Palm-tree plantation.

There is strong pressure on palms (Euterpe edulis) for collection of palm hearts. Although the cutting of the trees is forbidden, some local communities live on this activity. Recent research has shown that cultivation of Euterpe is feasible in the forest. Incentives are being considered in order to plant these trees in their natural environment. This can become an important source of income for the local population.

4. Transportation schemes for fisheries products.

During some seasons, quantities of fish caught by isolated villagers are thrown away because there are no commercialization schemes available. SUDELPA, Secretary for the Environment, are planning to assist villagers by providing a boat which can be used to bring ice to conserve fish and to bring fish to the market. Through this system the State might stimulate a more diversified use of the fishery resource, increase profits, reduce waste, and reduce pressure upon the resource.

6. CONCLUSIONS

The present conservation policies in Brazil have to be improved if biological diversity is to be maintained. The extremely rapid degradation of the coastal ecosystems requires immediate action. A broader policy framework which recognizes the right of survival of the traditional cultures along the coast is an overall condition to effectively ensure biological diversity.

The main conclusions of this paper are:

1. In developing countries such as Brazil the use of economic incentives/disincentives to keep biological diversity has to be conceived in a broader social and cultural framework.
2. In these countries many forest and coastal ecosystems where protected areas are established constitute traditional habitats of peasants, fishermen and other indigenous populations. They make their living from these environments.
3. These traditional communities have a complex relationship with the natural environment which is not only of an economic nature. Values, traditions and cultural perceptions built during centuries play an essential role in defining their relationship with the environment and the natural resources.
4. Environment and natural resources are not seen by those traditional communities as a marketable good but result from a long period of cultural adaptations. For a series of reasons, they exploit the renewable resources in an ecologically sound and wise manner.
5. As these ecosystems are incorporated in the market economy, natural resources become market goods under pressure.
6. In order to protect important ecosystems, Governments create national parks. In general, one of the first measures is to expel traditional communities from those areas. However, results of this are often negative. Without the traditional users, these areas may suffer severe degradation from logging and mining groups. The presence of traditional communities can therefore be an insurance of conservation, provided that an adequate management scheme is found. Traditional management schemes can be an adequate source of improved management.
7. In tropical ecosystems with great biological diversity, the traditional multiple use of natural resources by traditional communities avoids overuse of a particular resource that might cause disruption in the food chain.
8. Financial incentives for intensive use of renewable natural resources may result in their degradation and in a serious loss of biological diversity. Effective economic incentives for conserving biological diversity should focus upon assisting local communities to benefit from traditional methods which use these resources sustainably.

7. RECOMMENDATIONS

The maintenance of the diversity of traditional cultures is one of the most important conditions for the conservation of biological diversity. At the same time the conservation of diversified ecosystems is the basis for the maintenance of rich traditional cultures. For that reason, it is recommended that:

1. special attention should be given to support the economic basis of the traditional coastal communities in Brazil which is characterized by an ecologically sound relationship with the environment,
2. land tenure regulations should ensure that the "caiçaras" and similar coastal communities retain control over their land in the face of pressure from land speculators,
3. economic incentives should be given to those traditional communities in order to maintain and ameliorate traditional coastal management schemes. Measures such as traditional controls upon entry into fishing grounds close to the communities should be legally established,
4. economic support should be provided to projects that reinforce the traditional complementarity of economic activities. Very often credits for monoculture or monofishing lead to overuse of natural resources. The traditional combination of various traditional activities is more conducive to conservation of biological diversity,
5. when a national park is created, traditional communities should be allowed to stay in protected areas provided that they are consulted on the aims of the project and that an adequate management scheme is agreed upon,
6. a sound management scheme should be based on the detailed knowledge that these communities have of their local environment and the ecological processes occurring there,
7. provisions have to be made to avoid environmental degradation through demographic growth. In this connection, alternative economic activities compatible with the natural potential of the ecosystems, such as mariculture, have to be implemented,
8. incentives should be given to the use of adequate technology for reforestation, mariculture, fishing, etc.
9. taxes collected from industrial plants which cause pollution should be used for efforts to conserve biological diversity in the territories used by traditional communities,
10. economic aid and incentives should be provided to guarantee the survival of the traditional cultures, through the reinforcement of their economic basis,
11. sustainable development projects should take the traditional villages as units for development undertakings. Local organizations such as fishermen guilds and peasant associations should constitute the basis for such projects,

12. special incentives should be provided to maintain the traditional layout of the coastal villages, with communal and private spaces. In particular, part of the beach space should be reserved for fishing activities,
13. specific educational and cultural programmes should be organized in order to make full use of the traditional coastal cultures and the environmental conservation practices that are rooted in their culture.

8. APPENDIX

List of plants of the Atlantic Forest.

Cecropia glaziovii	Moraceae	umbaúba
Pourouma acutifolia	"	baúbu
Sorocea illicifolia	"	guaricica
Ardisia martiana	Myrsinaceae	capororoca-da-mat
Virola gardneri	Myristicaceae	bacuibucu
Virola oleifera	"	"
Calyptantes sp	Myrtaceae	araçarana
Myrcia sp	"	"
Guapira calycantha	Nyctaginaceae	canjiqueira
Astrocaryum aculeatissimum	Palmae	brejaúba
Euterpe edulis	"	jiçara, palmito
Syagrus pseudococos	"	pati
Attalea dubia	"	palmeira-indaiá
Alseisfloribunda	Rubiaceae	taruma
Amaioua guianensis	"	guapeva
Bathysa australis	"	araribao
B. gymnocarpa	"	guapeva-fraca
Coussarea porophylla	"	pasto-de-anta
C. meridionalis	"	moela-de-macuco
Cupania oblongifolia	Sapindaceae	cubata
Chrysophyllum ramiflorum	Sapotaceae	guaça-de-leite
Micropholis sp	"	guapeva-forte
Qualea gestasiana	Vochysiaceae	canaíba
Anaxagorea dolichopetala	Annonaceae	haste-de-fisga
Xylopia brasiliensis	"	pindaubuna
Malouetia arborea	Apocynaceae	guerana
Aspidosperma campactinervium	"	peroba
Ilex theezans	Aquifoliaceae	cuticaém-vermelho
Didymopanax caleum	Araliaceae	imberotó
Jacaranda semiosserrata	Bignoniaceae	caroba
Eriotheca pentaphylla	Bombacaceae	imbirucu
Licania sp	Chrysobalanaceae	simbiuva
Terminalia januariensis	Combretaceae	piúna
Vernonia discolor	Compositae	cambará-guaçu
Sloanea Guianensis	Elaeocarpaceae	sapopema
Hieronyma alchorneoides	Euphorbiaceae	uricurana
Mabea brasiliensis	"	canudo-de-pito
Pera glabrata	"	chili
Rheedia brasiliensis	Cuttiferae	bacupari
Cryptocaria moschata	Lauraceae	canela-noz-moscad
Ocotea sp	"	canela
Cariniana estrelensis	Lecythidaceae	jequitibá-branco
Lecythis pisonis	"	sapucaia
Sclerolobium denudatum	Leguminosae	ingá-da-mata
Monoschisma leptoscahyum	"	cauvi
Pithecolobium pedicellare	"	timbuíba
Hymenolobium janereisence	Lotoidea	gracuí
Miconia candolleana	Melastomataceae	pixirica
Cabralea cangerana	Meliaceae	cajarana
Mollinedia triflora	Monimiaceae	perta-guela

List of animals found in the Atlantic Forest.

Monodidelphidae	Marmosa microtarsus Didelphis marsupialis*	marmosa gambá
Vespertilionidae	Eptesicus hilarii	morcego
Cebidae	Cebus nigritus Cebus apella* Alouata fusca*	mico macaco prego bugio
Procionidae	Procyon cancrivorus nigripes Nasua solitaria solitaria*	mao pelada quati
Mustelidae	Tayra barbara barbara* Grison furax* Lutra platensis*	Irara Furao Lontra
Sauridae	Saurus ingrami ingrami	caxinguele
Erethizontidae	Coendu villosus* Coendu roberti*	ouriço ouriço
Cuniculidae	Cuniculus paca*	paca
Caviidae	cavia aperea*	preá
Bradipodidae	Bradipus tridactylus	preguiça
Dasypodidae	Dasypus novencinctus* Euphactus sexcinctus flavimanus	tatu-galinha tatu

List of birds found in the Atlantic Forest.

Tinamidae	Tinamus solitatus* Crypturellus notivagus notivagus*	macuco inhambu
Cracidae	Penelope obscura* Penelope superciliaris* Pipile jacutinga*	jacuguaçu jarupemba jacutinga
Phasianidae	Odontophorus capueira	urié
Psittacidae	Ara chloroptera* Aratinga auricapila auriflons Amazona brasiliensis*	arara jandaia* papagaio
Columbidae	Columba plumbea* Leptotila cerreuxi*	pomba juruti

Rhamphastidae	Ramphastus toco*	tucanuçu
	Ramphastus vilelinus	tucano bico preto
	Baillonus bailloni	tucaninho
Furnariidae	Furnarius rufus	joao de barro
Tyranidae	Euscarthmornis	
	nidipendulus	cagassebo
Pipridae	Pipretes chloris	dançador
Cotingidae	Atila rufus	capitao de saíra
	Ampelion cucullatus	
Turdidae	Turdus albicollis*	sabiá
Troglodytidae	Thryothorus longirostris*	curruirao
Picidae	Picumnus cirrhatus	pica-pau
Fringilidae	Sporophila frontalis	

List of plants found in sand barrier islands and dunes of S. Paulo coast.

Acicarpa spathulata	Calyceraceae	carrapicho da praia
Canavalia obtusifolia	Leguminosae	feijao da praia
Centella asiática*	Umbelliferae	cairussú
Cereus pernambucensis	Cactaceae	cardo da praia
Chrysobalanus icaco	Rosaceae	abajeru, guajuru
Cyrtopodium paranaensis	Orchidaceae	sumaré
Hydrocotyle umbellata	Umbelliferae	Açariçoba
Ipomeae littoralis	Concolulaceae	Salsa da praia
I. pes-caprae	"	"
Lantana undulata	Verbenaceae	cambará
Paspalum vaginatum	Graminae	grama doce
Phaseolus adenanthus	Leguminosae	feijozinho do campo
Philoxerus portulacoides	Amaranthaceae	capotiraguá
Quesnelia arvensis	Bromeliaceae	gravatá
Remirea maritima	Cyperaceae	pinheirinho da praia
Sophora tomentosa	Leguminosae	comandaíba
Spartina ciliata	Graminae	capim salgado
Tibouchina holosericea	Melastomataceae	orelha de onça
Ternstroemia brasiliensis		manjurovoca
Vanilla chamissonis		baunilha
Ilex microdonta		cauna
Pithecolobium lusorium		timbouva
Tabebuia cassinoides		caxeta
Calophyllum brasiliense		guanadi
Eugenia sp		pitanga
Myrcia sp		araça

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