Ethnic and biological diversity
Within the seaflower biosphere reserve

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Declared the SEAFLOWER Biosphere Reserve by the UNESCO program "Man and the Biosphere" (MAB) in 2000, the Archipelago of San Andres, Old Providence and Ketlina is part of the World Network of Biosphere Reserves.

Of the total area of the archipelago, 1,600 square kilometres are dedicated to conservation (core zones); 73,900 square kilometres are dedicated to conservation and programs of low-impact sustainable use (buffer zones); the rest of the SEAFLOWER Biosphere Reserve (approximately 224,500 square kilometres) are dedicated to the development of cooperative environmental management activities that give rise to an alternative sustainable development model (cooperation or transition zones).

The archipelago of San Andres, Old Providence, and Santa Catalina is located in the western Caribbean and covers approximately 350,000 square kilometers of marine area. Related to the Antilles in historical and ethnocultural terms, it has been an important and strategic Colombian territory since the 1800s and gained the status of Colombia's only oceanic department in article 309 of the National Constitution of 1991. The actual landmass consists of three major islands, five atolls to the north of the major islands, and two atolls to the south. The Corporation for the Sustainable Development of the Archipelago of San Andres, Old Providence, and Santa Catalina Islands, CORALINA, is the regional government authority within the national system of environmental management responsible for encouraging sustainable development and implementing environmental policies for the archipelago. Within the context of CORALINA, as in any environmental protection agency throughout the world, of paramount importance to our work is preservation of the diversity of natural resources within the region -- in both biological and ethnic terms.

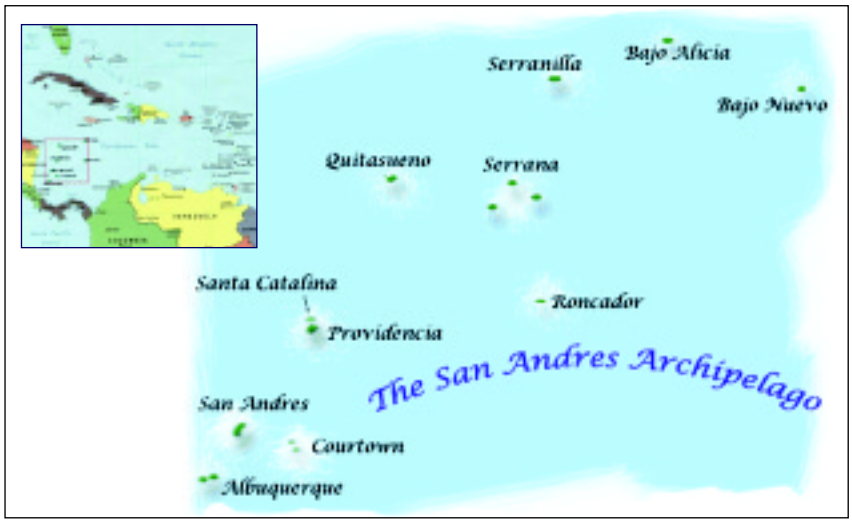
Ethnic diversity within the Archipelago Biosphere Reserve

a. The Convention on Biodiversity, which Colombia ratified in the congressional law 165 of 1994, stimulated the United Nations Environment Program and the Global Environment Facility to commission the Global Biodiversity Assessment (GBA) which was completed in 1996. The GBA repeatedly emphasizes that the main impacts on biodiversity are caused by human use and management. This study, now a seminal reference on the topic of biodiversity, also emphasizes that in questions of how to protect biodiversity and develop socio-economic strategies for its sustainable use, people must be seen to be a major part of the solution rather then being regarded as the problem.

Biological diversity resulted from the processes of natural selection and adaptation to the realities of the physical environment -- climate, geology, land and seascapes, food and water sources, etc. In the same way, cultures adapted themselves in appropriate ways to survive and thrive within their environments. It is significant to keep in mind that *homo sapiens* is the only land-based biological species, either plant or animal, that lives in every terrestrial geographic and climatic region found on Earth. Humankind accomplished this remarkable feat of single species adaptation through the development of ethnic diversity. In human development terms, therefore, ethnic variations can be seen as comparable to an expansion of biological diversity in other species of the natural kingdom.

Recognition of the reality and significance of ethnic diversity is of the utmost importance because part of the solution to the dilemma of how to achieve sustainable development is contained within the traditional knowledge of local ethnic groups. In addition, since environmental problems must be solved by people, in order to mobilize local communities to act towards this goal, their societies must be united around a common vision of

San Andres Archipelago



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environmental protection and sustainable development which grows out of a shared understanding of the cultural and ethnic reality of their past, present, and future situations.

One of the first worldwide programs to explicitly incorporate the concept of ethnic diversity was the UNESCO Man and the Biosphere (MAB) program. The World Network of Biosphere Reserves protects both biological and ethnic diversity. Indeed, a cornerstone is the belief that sustainable development can best be realized by combining traditional ethnic responses to the environment with appropriate new technologies, understanding that local programs of sustainable development and ecosystem conservation need to be rooted in the realities and traditions of the local people. The Seville Strategy for Biosphere Reserves of 1995 has as goal I: "Use biosphere reserves to conserve natural and cultural diversity." This goal is further elaborated in objective I.1 which reads: "Improve the coverage of natural and cultural biodiversity by means of the World Network of Biosphere Reserves."

With the acceptance that the dominant quantitative growth model of development is not environmentally sustainable and that development criteria must vary depending on the specific environmental conditions, the realization has come that much of the damage done to environments, particularly in this century, has resulted from the failure to acknowledge that local cultures have the know-how to manage local ecosystems. For example, since indigenous peoples unconsciously functioned within natural boundaries, vital information relative to what we now call carrying capacities can be found within the collective knowledge of ethnic cultures.

In the process of designing both sustainable development projects and appropriate environmental education programs for a region, environmental problems and methods must be analysed in the perspective of cultural actualities, such as:

- the importance and meaning of land within the culture;
- the system of property rights and actual land ownership;
- religion -- particularly in regard to beliefs about humankind's designated role in the natural world, the creation, and sabbath or holy day practices;
- methods of raising and gathering food and animals;
- systems for handling water, soil, and waste products;
- ways that overall lifestyle have balanced and restrained resource use and consumption.

Not only will people respond better and become more committed to programs which directly emerge from and appeal to their ethnic situations, but such programs, by being based on tangible and practical realities, are far more likely to succeed.

b. The Environmental Action Plan for Latin America and the Caribbean, adopted in 1990 by 35 countries in the region including Colombia, says:

In Latin America and the Caribbean, there are at least 480 ethnic groups that have remarkably adapted to their natural surroundings and have traditional agrarian cultures endowed with precise knowledge of natural resources, consumption patterns, suitable work and, above all, a concept of the environment that is not antagonistic. The deterioration of this invaluable cultural heritage is resulting in enormous ecological costs.

The Action Plan seeks to tap the environmental knowledge and management capacity that some ethnic groups of the region have achieved, which could serve as a basis for the design of local environmental management projects.

Within Colombia, one of the main ethnic minorities is the native islander population of the archipelago of San Andres, Providence, and Santa Catalina. Close in heritage to the populations of other English-speaking West Indian islands, the natives of the archipelago have nonetheless developed a particular ethnic identity within the Caribbean region as a result of adapting to specific environmental circumstances. Predominant among these defining factors are:

- the small amount of landmass within the archipelago (San Andres has 25 square kilometres, Old Providence has 20, and the entire archipelago has approximately 52.);
- the islands' geographic isolation within the Caribbean;
- scarcity of fresh water;
- the high rate of terrestrial biodiversity relative to the smallness of the land area;
- access to a wealth of marine biological variation;
- an actual location to the southwest of the major Atlantic hurricane path.

When a culture has emerged from a colonialist New World heritage (rather than being indigenous per se), clearly its ethnicity has also been profoundly affected and formed by outside cultural pressures and historical factors. Many such factors contributed to the specific acculturation of the islander people. Especially significant were the proximity to Central America's Miskito Coast, the historical reality that the society of the archipelago did not grow out of a Caribbean plantation society, and the fact that the island culture was left to develop on its own for several hundred years with minimal outside political interference or direction.

These environmental and cultural realities contributed to forming a society that was still characterized as recently as 1960 by:

- a high level of self-sufficiency and independence;
- a particularly egalitarian and democratic class structure;
- virtually no technological development;
- a productive and sustainable agrarian and subsistence fishing economy;
- a system of measuring wealth in terms of "real" goods, especially an abundance of food and an amount of land and/or animals, rather than in monetary terms;
- an exceptionally high quality of life (and actual standard of living within the region);
- functional conservation practices -- par-

ticularly in the management of scarce soil and freshwater resources and in the small amount of garbage and contamination generated.

Development policies of the last three decades have resulted in massive environmental degradation, especially in San Andres, and a growing loss of ethnic identity. The environment and culture of Old Providence and Santa Catalina have remained more intact but the possibility of large-scale development by outside forces remains a reality of the current situation. The people of the archipelago are confronted by the same threats that are destroying ethnic and biological diversity throughout the world -- overpopulation, urbanization, increasing pressure on natural resources and ecosystems, poorly planned development, and the resulting loss of ethnic responses, self-reliance, and cultural identity.

However, as one of the least environmentally degraded areas remaining in the Caribbean region, these tiny islands could serve as models of small island development and recuperation if their biologic and ethnic diversity could be protected, respected, and allowed to flourish in future development planning. With these goals in mind, current general strategies to encourage conservation and sustainable development both environmentally and culturally include:

- special management plans for significant ecosystems;
- environmental education programs based in ethnic realities;
- community organizing at the grassroots level;
- increased local autonomy and community participation in environmental conservation and development planning;
- management plans which integrate local interactions between the community and the environment, traditional resource use and development, and appropriate native technologies;
- development of programs which allow access to sustainable alternative technologies;
- a strong land-use plan and territorial ordering process based on traditional use and research on carrying capacities;
- special regulations to restrict immigration and construction;
- openness about and enforcement of local, national, and international norms that protect biological and ethnic diversity;
- preparation for and application to join the UNESCO World Network of Biosphere Reserves.

Biodiversity within the Archipelago

The biodiversity of small islands like San Andres, Old Providence, and Santa Catalina is obviously limited when compared to the abundance of continental zones, particularly in the humid tropics. Endemic organisms are present in less quantity, making them more vulnerable to human activity. Indeed, any alterations in ecosystems can produce transformations, and the resulting changes are unpredictable in the majority of cases. Also, because of the limited space and isolation of certain oceanic islands, scientists have theorized that they are particularly generative places for species specialization. The importance of locally protecting species diversity and habitats is clear since the islands serve as both crucibles and microcosms of the great ecosystem that is our biosphere.

Terrestrial flora

San Andres has residual forest in only a few areas because much of the woodland was converted to coconut plantations years ago, and a growing amount of wooded area has been sacrificed to make space for the massive immigration, primarily from the continent, that has occurred since 1960. Nevertheless, in the patches of native vegetation which remain are still found representative forestal trees including cedar (*Cedrela odorata*), matarraton (*Gliricidia sepium*), kapok or cotton tree (*Ceiba petandra*), stinking toe (*Cassia grandis*), birch gum (*Bursera simaruba*), guacimo (*Guazuma ulmifolia*), hog plum (*Spondias mombin*), and june plum (*Spondias purpurea*).

Many yards in the native sections of San Andres are well-planted with ornamental flowers and fruit trees which are also found in the wooded sections. Especially abundant are breadfruit (*Artocarpus altilis*), tamarind (*Tamarindus indica*), mango (*Mangifera indica*), guava (*Psidium guajava*), almond (*Terminalia catappa*), guinep (*Melicoccus bijugatus),* and assorted citrus.

The islands of Old Providence and Santa Catalina are the only islands in the archipelago where a true tropical forest ecosystem developed. This forest was not studied until recently, but current research has produced valuable information. As the general environmental conditions of these islands supported the growth of the tropical forest with its resultant species diversity, it is of value to briefly present some of these conditions.

Old Providence and Santa Catalina are mountainous islands with respective land areas of 20.8 and 1.3 square kilometers. According to geological studies, the islands originated as an atoll 80 million years ago (Miocene). The present topography resulted from later eruptions which took place approximately 30 million years ago. Many researchers suggest that the two islands were connected at one time. Technical studies made by CORALINA in 1997 isolated 23 geomorphological units that can be grouped into three main types:

- Mountains: with a maximum altitude of about 360 meters, these are located in the centre of the islands and are characterized as rugged and craggy.
- Hills: with maximum altitudes of about 100 meters, these are found surrounding the mountains and are rounded, having resulted from erosion of the mountains.
- Plains: these include beaches and alluvial valleys which are of either marine or alluvial origin.

The islands are surrounded by a well-developed barrier reef, especially to the north-northeast or windward side. This coral reef system covers approximately 255 square kilometers and encloses an extensive lagoon which is rich in sea grass beds. The coastal areas have the mangrove swamps necessary to complete a highly intact reef ecosystem which can be characterized as very productive.

The precipitation cycle is monomodal - the first season is dry (February through April with May considered to be transitional)

and the second season is described as wet (June through December with January transitional). The heaviest rains occur in October and November. However, the distribution of rain is far from regular; out of a total mean annual rainfall of approximately 1,600 mm, more than 70 percent usually falls in a period of a few days. This situation causes frequent water shortages, little possibility of replenishing wells or groundwater (which are consequently not an important human water source on these islands), and irregular and intermittent strong gully or stream flows During the years when the amount of rainfall is particularly low and air temperatures are correspondingly higher (for example, during periods influenced by *EL NIÑO*), natural regeneration of the forest does not occur because of the water deficit.

As would be expected under these environmental conditions, the vegetation in the islands has been classified as tropical dry forest. At the present time, 374 species have been identified which are distributed between 93 families and 7 pteridophytes (Lowy, 1994). The main plant families are Euphorbiaceae, Fabaceae, Compositae, Rubiaceae, Malvaceae, and Caesalpinaceae. Seventy percent of the species are considered to be native and 23 percent to have been introduced. There are several species represented that have been found elsewhere only in Jamaica; for example, the species of palm *Cocotrinax jamaicensis*. Complementary other species are widely distributed throughout the New World.

These species show an affinity with the flora of the Antilles and Central America as well as with that of northern South America. Reknowned botanist, Alwyn H. Gentry, remarked in his field notes on Old Providence that:

> Floristically the forest is very Antillean.... (However,) the forest is very diverse by Antillean standards; with ca. 60spp. >=2.5cm dbh in 0.1ha. This compares with an average of 43 in Greater Antillean moist forest and 46 in dry forest. It is also unusually well preserved for the Antilles.... Overall evaluation: An interesting mix of mainland and Antillean flora, but more related to the latter and thus of great conservational significance.

The mature forest occupies 148 hectares (7.22 percent of the island's area) and is found in the mountains, relatively far from human settlements. CORALINA field studies report 145 species, with the most diversity in the sector known as Freshwater. Species like the kapok or cotton tree (*Ceiba petandra*), first stick (*Chlorophora tinctoria*), strangler fig (*Ficus sp.*), promenta (*Pimenta dioica*), trumpet tree (*Cecropia peltata*), birch gum (*Bursera simaruba*), crabwood (*Byrsonima crassifolia),* and *Faramea occidentalis* are common in the forest. The mean base area for the trees is 22 m/ha, with an average of 17 meters in height and a density of 0.1 ind/m^2, which indicates that this forest is not primary but is in good condition and is growing towards climax.

Shrubs are the most abundant vegetation type, covering 1,444 hectares (70 percent). The most dominant species of this type of vegetation is the cockspur tree (*Acacia collinsii*) which can grow in dense thickets, sometimes monospecifically. Many acacias are especially adapted to dry conditions and are common invaders of grasslands and shrubby woodlands. This shrub has a symbiotic relationship with a species of stinging ant (*Pseudomyrmex ferruginea*) that protects the tree from encroachment by other vegetation and human or animal use; the exception being several species of resident birds that nest in the cockspur. Other significant shrubs include: *Cordia collococca*, *Cassearia sylvestris, Randia glumeri, Croton glabelus,* and *Pithecellobium dulce*. Additionally, many fruit trees are found in both mature forest and shrub ecosystems.

At the present time on Old Providence, 425 hectares have been converted to pasture for grazing cattle. Annually more shrubs, and occasionally forest, are cleared to make grasslands. Besides posing a major threat to the future of the natural flora, cattle-raising increases the amount of soil erosion, destroys the process of natural regeneration, and is not an important food source for the islands. To protect the terrestrial biodiversity of the island, CORALINA is working with the 80 or so persons who are raising an estimated 400 head of cattle with the goal of developing a sustainable solution to this problem.

Terrestrial Fauna

Less is known about the fauna of the islands. There are a number of resident and endemic reptile species which include two species of snake -- silver snake (*Leptothyphlops albiprons*) and *Coriophanes andrensis* -- and abundant lizards such as the iguana (*Iguana iguana*), penny lizard (*Anolis pinchoti*), brown lizard (*Anolis concolor*), jack lizard *(Ameiva ameiva),* blue or green lizard (*Cnemidorphorus lemniscatus*), and snake-waiting-boy (*Mabuyo mabuyo*). Geckos and salamanders are represented by *Aristelliger georgeenis* and *Sphaerodactylus argus*. Two species of land turtles are found: hikiti (*Geochelone carbonaria*) and the San Andres' swamp turtle, locally called "swanka." The only registered amphibean is a species of endemic toad (*Leptodactylus insularis).*

In addition, the reptile group includes more introduced species than does any other group; of special significance are the boa or woala (*Boa constrictor*) and the lizard known as ishillie (*Ctenosaura similis*). Some of these have become abundant enough to disturb the islands' ecological balance; for example, the species known as "lobo pollero" in San Andres. Detailed studies need to be made on both the precise impacts of these introduced species and on the reptile group in general.

An important class of land animals on the islands are the crustacean land crabs of which there are several species; two of these are particularly important for their food and commercial value, black crab (*Gecarcinus ruricola*) and shankey (*Gecarcinus lateralis*). These species are wide-spread in both the forest and coastal zones. Annually these crabs effect a massive migration to the sea to spawn. Each black crab deposits around 40,000 eggs, which grow for two months in the form of marine plankton before returning to land. CORALINA is in the process of studying the black crab and developing regulations to insure its sustainable use, particularly by protecting it from vehicular traffic in its annual migration to and from the sea.

Birds

The most important class of terrestrial vertebrates is birds including land, marine, and migratory species. Approximately 98 species of birds have been identified in the islands, the majority of which are migratory. Only about 18 are resident with 2 endemic species known in San Andres and several endemic subspecies found in Old Providence. Some of these species are found on the major islands, and some marine species are found only on the north and south cays.

Among the most important resident species are the doves: wild pigeon (*Zenaida asiatica*), Caribbean or ground dove (*Leptotila jamaicensis*), and balley or bald pate (*Columba leucocephala*). Other resident birds of primary importance are the grass bird (*Tiaris bicolor),* wish wish *(Coereba flaveola),* god bird or hummingbird *(Anthracotorax prevostii*), banana bird or Jamaican oriole *(Icterus leucopteryx),* nightingale *(Mimus gilvus),* Caribbean elaenia *(Elaenia martinica),* and several species of warblers *(Dendroicae)* and vireos *(Vireonidae).* The old man bird or rainbird *(Coccyzus minor),* an endemic subspecies of cuckoo, is a favorite bird and the subject of local legends on the islands that is in danger of extinction as its chosen habitat is frequently mangrove swamps.

Mammals

The sole terrestrial mammals found are several species of bats, including *Natalus brevimanus*, *Artibeus jamaicensus*, and *Molossus molussus*. Marine mammals have occasionally appeared on the beaches, some of which have been rare species. Although whales are not commonly seen in the coastal waters, they are intermittently sighted.

Coastal and marine resources

Coral reef structure

Corals are widespread throughout the archipelago and the reef formations are particularly complex as a result of their oceanic location and the heavy wave action and turbulance to which they have adapted. The reef formations can be divided into three large complexes: 1) barrier reefs and sections lying north, northwest, west, and southwest on the shelf, 2) reef sections and patches in the lagoon behind the barrier reefs, and 3) coral communities and reefs on bordering ledges to the west.

San Andres Island is surrounded by a complex reef system on the insular shelf made up of a variety of coral formations: barrier and fringing reefs, patches, and associated lagoons. The windward barrier reef located on the eastern edge of the shelf is composed of a series of calcareous fossil terraces covered with well developed coral communities (50% live coral) including a wide diversity of hard corals, octocorals, and sponges. This reef, although not unbroken, runs from the extreme north to the south end of the island and is 15 km long and 60-80 m wide, providing effective breakwaters and a large lagoon. The coral reefs found in the waters surrounding San Andres are made up of approximately 40 identified species including: *Millepora* spp., *Porites porites, P. astreoides, P. furcata, P. divaricata, Diploria strigosa, D. clivosa, D. labyrinthiformis, Acropora palmata, A. cervicornis, Montastraea annularis, M. cavernosa, Sideratrea siderea, S. radians, Agaricia* spp., *Favia fragum, Isophyllastrea rigida, Dendrogyra cylindrus, Stephanocoenia intersepta, Madracis decactis, M. mirabilis, Leptoseris cucullata, Meandrina meandrites, Colpophyllia natans, C. amaranthus, Dichocoenia stokesi, Mycetophyllia* spp.,and *Eusmillia fastigiata.* Other corals commonly found include antipatharians, gorgonians, *Stylaster roseus, Zoanthus sociatus* and *Palythoa* spp.
The coral communities and reefs bordering the western ledges show the most influence of human activity. Coral tissue mortality here reaches levels between 5% and 100%. The most affected species is *Acropora cervicornis* which is practically extinct; other species including *A. palmata*, *Agaricia agaricites*, and *Colpophylia natans* are also affected. This deterioration is explained by macroregional processes and by the effects of anthropogenic agents (sedimentation, contamination, boat traffic, and tourism).

The Old Providence and Santa Catalina reef complex is regionally unique because it surrounds the only high altitude volcanic island found on the MesoAmerican shelf. The barrier reef is 32 km long and varies from 50-200 m in width, covering a total area of approximately 255 km^2. This reef is characterized as the second largest true barrier reef in the Western Hemisphere (Geister, 1997). The coral reef system surrounding these islands is divided into 4 units: fore-reef terrace, windward barrier reef, lagoon with patch and fringing reefs, and leeward and outer shelves. Identified species include *Millepora* spp., *Porites astreoides, P. porites, P. furcata* (var*), P. clavaria, Diploria strigosa, D. labyrinthiformis, D. clivosa, Agrarcia agaricites, A. crassa, Acropora palmata, A. cervicornis, Colpophyllia natans, Favia fragum, Dichocoenia stokesii, Montastraea annularis,M.cavernosa, M. faveolata, Dendrogyra cylindrus, Stephanocoenia michelini,Isophyllastrea rigida, Siderastrea siderea,* and *S. radians.* The area also includes black corals, fire corals, and lace corals as well as zoanthids. Because of huge populations of the masked hamlet; this specie received the name: *Hypoplectrus providencianus;* and is on the IUCN Red List.

Albuquerque Cay (South-Southwest Cay) Is the only reef complex that resemble a true atollon, being nearly circular with a peripheral reef to windward that extends along the north, east, and southeast sides for close to 6 km. In shallow waters reef crest is barely submerged, and composed by a combination of *Millepora-Palythoa-Porolithon.* The lagoon has two well defined depths: 9 m and 15 m, were well developed sea grass beds and a significant quantity of hard corals, octocorals, patches of *Montastraea* and peripheral reefs of *Acropora palmata can be found*.

Bolivar and Courtown Cay resemble a kidney-shaped atoll that has a diameter of a little over 13 km. The windward reefs developed towards the northeast, east and southeast. Strong waves and currents, turbulences, and an intricate system of caves have created a unique and unusual reef environment (Geister, 1997). The northern part of the lagoon is covered with dense patches of reef, predominantly hard coral of the genus such as *Millepora, Diploria, Montastraea, Porites.* and *Acropora*.
Few years ago there was abundant queen conch and spiny lobster on both cays.

Queena is the most extensive atoll of the Archipelago, although it is commonly described as a half atoll with 60 km in length and between 10 and 20 km wide. It has a windward reef that extends more than 40 km and includes shelf areas. Although it doesn't have terrestrial area, the bank is shallow and partially exposed at the low tide. The reef is mainly composed of *Millepora spp.*, and *Acropora palmata* that is common in the leeward area. Irregular patch reefs, exhibiting both ribbon and knoll configurations are plentiful. This is one of the least studied areas of the Archipelago, in spite of being considered one of the most productive sites for queen conch and spiny lobster in the southwestern Caribbean.

Serrana is an extensive reef complex of around 36 km in length and 15 km wide, including the insular platform. There is an extensive lagoon with numerous seaweed patches and sea grass beds which are highly productive. There is a secondary barrier, long and narrow, with the predominant *Acropora palmata* creating a calm system, with reef patches (*Montastraea*) covering 60% of the bottom. Other plentiful coral species are *Agaricia agaricites, Porites spp., Mycetophyllia ferox, Diploria spp., and Siderastrea siderea*, among others.

Roncador is an elongated atoll of approximately 15 km in length and 7 km width. The windward peripheral ref is almost continuous for 12 km and breaks surface in calm weather. The lagoon, which is shallower than the others in the region, is exposed at low tide. Dense patches of *Montastraea* almost reach the surface, with thickets of *Acropora cervicornis* growing along the crest. In the southern part of the lagoon, reef patches cover 70% of the bed. Other significant coral species are *Acropora palmata, Diploria spp., Agaricia undata, A. lamarcki, Montastraea franksi, Mycethophyllia aliciae* and *M. reesi*. The Gorgonians are numerous, and therefore it is presumed that the massive mortality that devastated this species in other areas of the Caribbean had little effect here and on Serrana.

Mangroves

There are twelve mangrove lagoons on San Andres, Old Providence, and Ketlina, made up of red, black, white, and buttonwood mangroves. The mangrove stands show classic zoning pattern with tidal height, with red mangroves in shallow water, black mangroves in intertidal mud flats, and white and buttonwood growing higher still. Old Providence and Ketlina has six major mangrove swamps: Oyster Creek, Manchineel Bay, Southwest Bay, Old Town, Jones Point, and Ketlina. San Andres has seven main mangrove swamps, only three of which are in direct contact with the sea (Honda Bay, Hooker Bight, Cove Seaside).
Several mangrove lagoons on these islands were destroyed by development. However, current law strictly protects existing mangroves from any human activity.

Seagrasses

Seagrass beds in the Archipelago are found primarily along the shore of the larger islands. Beds are made up primarily of turtle (*Thalassia testudinum*) and manatee (*Syringodium filiforme*) grass. A third species, *Halodule wright* is also found in waters around Old Providence.

The seagrass beds appear to be productive and healthy in the areas where they still occur. Nevertheless, they continue to face threats from pollution, development, and boating activity in shallow water. Most of these threats are currently regulated carefully by local law.

Only one research study has been done on sea grasses within the archipelago which was realized from February to September of 1997 (Angel and Gonzalez). It reached the following conclusions:

- Two registered species are found around San Andres Island -- *Thalassia testudinum* and *Syringodium filiforme*, the latter forming a small structurally homogeneous monospecies patch to the west of the island.
- Three registered species are found near Old Providence Island -- *Thalassia testudinum, Syringodium filiforme,* and *Halodule wrightii.* Two species are found near Ketlina -- *Thalassia testudinum* and *Syringodium filiforme.*
- The beds of *H. wrightii* are situated in shallows and near mangroves and are separate from *T. testudinum* and *S. filiforme*.
- The sea grass beds are structurally heterogeneous as shown by high fluctuations in density, biomass, and morphometry.
- In shallow zones, boat traffic, anchors, and multiple coastal effluents are some of the anthropogenic causes of sea grass deterioration around the islands.

Beaches

The most important beaches in San Andres are: Sprat Bight, Coccoplum Bay, Rocky Cay, Sound Bay, Smith Channel, and Elsy Bar. Other popular tourist destinations include the nearshore cays, which are visited by an estimated two-thirds of all visitors: Johnny Cay, Haines Cay, and Rose Cay.

Beaches in San Andres are made of materials from offshore, with fine white sand particles of predominantly organic origin. The load of land-based sediments into the shallow lagoon enclosed by the reef system to the north and east of the island is small, allowing corals and sea grasses to remain relatively healthy in spite of threats posed by other factors such as improper waste disposal and over-extraction of species. Beaches are replenished by the breakdown of corals and other animal and plant species on the coastal shelf (Kielman, 1999). This sand is moved by wave action and currents.

Beaches are narrow, with low profiles and no dunes.

Old Providence and Ketlina has 5 principal beaches - Manchineel Bay, Southwest Bay, Freshwater Bay, Allen Bay, and Old John Bay - with a number more in isolated coves; the sand is of coral composition. Although small and regionally unexceptional the intactness of their natural settings, the lack of development or pollution, the quality of white sand, and their relative privacy are associated aspects that greatly enhance the value of these beaches as a tourist resource.

Sea turtles used to nest frequently on the islands and nests are still regularly found at several of the more isolated beaches, especially those on the uninhabited north coast of Ketlina. One of the major environmental problems on the islands is sand-mining which seriously threatens the quality and size of most beaches.

Native beach vegetation is trees like sea grape (*Coccoloba uvifera*), seaside mahoe (*Thespesia populnea*), coconut palm (*Cocos nucifera*), and West Indian almond (*Terminalia catappa*); shrubs including sea purslane (*Sesuvium portulacastrum*), bay cedar (*Suriana maritima*), beach bean (*Canavalia maritima*), marigold (*Complaya trilobata*), wild plantain (*Canna indica*), and sea lavendar (*Tournefortia gnaphalodes*); grasses like saltgrass (*Disticlis spicata*) and shoregrass (*Stenotaphrum secundatum, S. kuntze*), and trailing vines, especially beach morning-glories (*Ipomoea pes-caprae, I. alba*) and coral vine (*Antigon lectopus*). Large amounts of algae also wash up on north and east facing beaches, especially *Sargassum sp.* and *Dictyopteris sp.* (CORALINA, 2000).

Fish

Two hundred seventy-three species of associated reef fish have been identified within the Archipelago. These include two described endemic species: *Gambusia aestiputeus* and *Hypoplectrus providencianus.* In addition to these endemic species, several other species are listed on the IUCN Red List, including: the cotuero, whitespotted, whitelined, retuiclated, and splendid toadfish (*Batrachoides manglae*, *Sanopus astrifer*, *S. greenfieldorum*, *S. reticulatus*, and *S. splendidus*); hogfish (*Lachnolaimus maximus*); mutton and cubera snapper (*Lutjanus analis* and *L. cyanopterus*); rainbow parrotfish (*Scarus guacamaia*); bigeye tuna (*Thunnus obesus*); jewfish, marbled, Warsaw, and Nassau (*Epinephelus itajara*, *E. inermis*, *E. nigritus*, and *E. striatus*); red porgy (*Pagrus pagrus*); queen triggerfish (*Balistes vetula*); and the smalltooth and largetooth sawfish (*Pristis pectinata* and *P. perotteti*). All of these species are listed as vulnerable except: the Nassau grouper, red porgy, and smalltooth sawfish are listed as endangered; and the jewfish, Warsaw grouper, and largetooth sawfish are listed as critically endangered.

Of the identified fish species, 131 species from 46 families have been recorded in San Andres coastal waters. One of the 2 endemic species, *Gambusia aestiputeus,* is found in the Hooker Bight mangroves.

Sea Turtles

Four identified sea turtle species use beaches in the Archipelago for nesting. Loggerhead turtles (*Caretta caretta*) are the most common nesters, particularly on Seranilla Bank in June and July. Hawksbill turtles (*Eretmochelys imbricata*) also nest frequently, with Serrana and Roncador Banks the most common place and August the most common time. Green (*Chelonia mydas*) and leatherback turtles (*Dermochelys coriacea*) have also been seen nesting. It is also possible that the Archipelago is home to Kemp's and olive ridley turtles (*Lepidochelys kempii* and *L. olivacea*) but these species have not yet been described. All of these sea turtles receive international protection. Each is listed in appendix I of CITES, reserved for rare or endangered species, and is listed as critically endangered (hawksbill and Kemp's ridley) or endangered (all others) on the IUCN Red List. Beaches on the northern banks and southern atolls play a particularly important role as nesting habitat for these species, although historically they also nested on the main islands. Sporadic nesting still occurs in San Andres along with regular nesting at several spots in Old Providence, most notably Old John and Mona Bays on the northern coast of Ketlina. The sea grass beds of the southern cays are particularly important feeding grounds for immature species particularly.

Sea Birds

76 species of migratory birds, together with 18 resident species including 2 endemic and some endemic sub-species, have been detected in the Archipelago (Bond, 1980 and Hilty and Brown, 1986). The majority are to be found in the mangroves, cays and coastal areas. The information on marine birds is scarce, but the most abundant species are the man o' war (*Fregata magnificens*), the laughing gull (*Larus atricilla*), the tern (*Sterna spp.*), and the red-foot and brown foot booby.

The northern banks are also an important nesting area for sea birds, particularly red-footed and brown boobies (*Sula dactylatrea, S. sula*) and laughing gulls (*Larus atricilla*). Magnificent frigate birds (*Fregata magnificens*) terns (*Sterna fuscata, S. maximus.*), and puffins (Puffinus puffinus, P. griseus) nest in the region, and are commonly found throughout. Many other shore and sea birds pass through the region during migrations as the Archipelago is at the edge of the western flyway.