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Biodiversity Associated with Mangroves in Colombia

Colombian mangrove forests can be classified as: dry tropical (bsT) on the Caribbean coast and very humid tropical (bmhT) on the Pacific coast (L.R. Holdridge), where they were most developed (with 10 m prop roots) before being commercially exploited. On the Caribbean, mangroves are distributed in thin strips in wetlands, bays, inlets and beaches, and in the deltas and large estuaries of the Magdalena, Sinú, San Jorge and Atrato Rivers. On the Pacific, mangroves are forest strips parallel to the coast, which penetrate up to 20 km into the main land due to the 4 m tides that occur here. These strips are found all the way from the frontier with Ecuador up to Cape Corrientes, where these strips turn into patches. (Alvarez-León, 1993)

Five species of mangrove have been established for the Caribbean: red (*Rhizophora mangle*), black (*Avicennia germinans*), white (*Laguncularia racemosa*), zaragosa (*Conocarpus erecta*) and pine (*Pelliciera rhizophorae*). The following species have been found on the Pacific: red (*R. mangle, R. racemosa*), black (*A. germinaris*), white (*L. racemosa*), button (*C. erectus*), pine (*P. rhizophorae*) and flat-nosed or nato (*Mora oleifera*). Despite the similarities between the mangroves of the two coasts, there are differences in the flora.

The zonation of mangroves may be determined by local environmental conditions (great variety in a reduced geographical area). In the Caribbean, salinity is directly affected by the climate. The Pacific distribution of mangroves in zones may be determined by substrate stability: Salinity is low due to high precipitation (more than 3000 mm/year) and to the constant tidal action. The abundance of fresh water with inorganic nutrients also permits the extraordinary development of heights (above 40 m), major productivity and a great capacity to export organic detritus. In the Caribbean most of the trophic net depends on phytoplankton while in the Pacific it is based on bacterial detritus. (Prahl *et al.*, 1990). Colombia presents, not only the classic mangrove zone, but a range that goes from real pines to mixed forest with two or more species with no definite limits, which in their ecological development show a structurally typical zone extension that becomes a climax community. (Alvarez-León, 1993)

Primary productivity in Colombian mangrove has been studied in detail, in the Caribbean the three main species (*Rhizophora, Avicennia, Laguncularia*) have led to the analysis of the areas of major importance: "Ciénaga Grande de Santa Marta" on the deltic river plain of the Magdalena River and "Ciénaga de Cocoliso" a lagoon on a coral island of the Rosario and San Bernardo Corals National Natural Park. In the Pacific; the study included six species (*A. germinans, L. racemosa, M. oleifera, P. rhizophorae, R. mangle, r. racemosa*) in Utria and Sanquianga National Natural Parks, Los Limones Inlet, Guapi area and the adjacent localities of Tumaco (Bocagrande and Pasacaballos). So far, a greater productivity has been observed in the Caribbean forest, which may be due to natural defoliation.(Alvarez-León, 2000)

Prahl et al. (1990) and Alvarez-León (1993) group the species that have been studied as organisms that: (1) live in direct association with the roots of the *Rhizophora* and *Avicennia*; (2) are herbivorous (use 15-20% of the foliage), insects (tend to defoliate mangroves under tension), crabs and mollusks (feed themselves from young stems) as well as iguanas, and mammals; (3) birds make use of the mangroves for their activities. On the Pacific coast bromeliads and orchids grow on tree trunks and, their branches retain water and materials falling to the ground. (4) amphibians use the mangroves for shelter and feeding during short periods. Reptiles migrate from the continent as well as mammals, and aquatic animals make their way through the roots when swimming from the estuaries and lagoons. The fauna and flora of mangrove swamps are highly diversified on both coasts, some of those associations are: Some plant species associated with mangrove forests throughout their distribution and both coasts have been considered as true mangrove by certain authors e.g., *Acrostichum aureum* L. and *Hibiscus tiliaceus* L. which occur throughout the New world. These poorly understood species frequently form dense belts along landward and elevated areas, and around dry or saline areas of mangrove.

On the Pacific coast: the most common plants are: the 45m high *Mora oleifera* (Pittier) (Caesalpinaceae), *Euterpe cuatrecasana* Dugand (Palmaceae), *Hibiscus tiliaceus* Linnaeus (Malvaceae), *Crenea patentinervis* (Koehne) (Litraceae), *Pavonia rhizophorae* Killip (Meliaceae), *Tabebuia palustris* Hemsl. (Bignoniaceae), *Tuberostylis axillaris* Blake y *T. rhizophorae* Steetz (Compositae), *Anphitecna latifolia A. Gentry* (Mill.), *Muellera moniliformis* L.F., *Phryganocydia phellosperma* Sandw (Hemsl.), among others (Cuatrecasas 1958; Gentry 1982). The sandy areas are represented by plants such as *Cenchrus pauciflorus* and *Homolepis aturensis*, as well as climber plants *Canavalia maritima, Ipomea pes-capre, I. stolonifera, Pectis arenaria* y *Stenotaphrum secundatum* (Prahl et al., 1990). On this coast, it is also possible to find a variety of Bromeliad and Orchid epiphytes, which

invade the canopy of mangrove forest, such as *Vrissia grandioliflora* (Wend) (Londoño y Marín, 1988) and *Guzmania musaica*, and the Musaceae *Heliconia bihai* (Paz, 1980).

On the Caribbean coast the most common salt marsh species associated with mangroves are *Batis maritima* L. (Batidaceae), *Sessuvium portulacastrum* L. (Aizoaceae), *Typha domingensis*, *Phryganocydia uliginosa*, the Graminae *Sporobolus virginicus* L. Kunth, *Paspalum vaginatum* Swarts, *Dietichlis spicata*, and the Cyperaceae (*Cyperus* spp.).The Apocynaceae liana *Rhabdadenia biflora* (Jacq) Hull (Jiménez, 1992) is reported as a typical component of mangrove forest. However, not many studies have been done on this plant and its effect over the favorite host mangrove (*R. mangle*) remains unknown.

It is very difficult to characterize a "true" mangrove fauna, since most of the animals found here are also found elsewhere, in other protected coastal areas, such as mud flats, sea grass beds and salt marshes. Over 140 bird, 220 fish and hundreds of terrestrial and marine invertebrate species create high faunal diversity environment along otherwise low biodiversity mudflats.

Some of the most common species on the Caribbean coast are represented by different groups such as bivalves *Brachiodontes citrinus, B. exustus, Isognomon alatus, Crassostrea rhizophorae, Ostrea equestris, Bankia destructa, B. fimbriatula*; gastropods *Littorina antillarum, Murex antillarum, Thais haemastoma, Nassarius albus, Melongena melongena, Melampus cofeus, Neritina virginea*; echinoderms *Ophiactis savignyi, Ophiothrix angulata, Diadema antillarum, Lytechinus variegatus*; and crutaceus *Chtalamus angustitergum, Balanus amphitrite, B. eburneus, Paraclimenes americanus, Synalpheus apioceros, S. minus, Stenopus hispidus, Panulirus argus, Petrolistes armatus, Clibanarius cubensis, C. vittatus, Eurypanopeus depressus, Panopeus fierbstii, P. typica, Microphrys bicornutus, Pinnotheres ostreum, Callinectes sapidus, Pachygrapsus gracilis, P. traversus.*

On the Pacific coast the representative fauna are bivalves *Isognomon janus, Cassostrea columbiensis, Anomia fidenas, Pododesmus foloiatus, Matesia striata, Bankia gauldi*; gastropods *Nerita scabricosta, Theodoxus luteofasciatus, Littorina fasciata, L. scabra, L. varia, L. zebra, Thais kiosquiformis, Nassarius wilsoni, Elloium stagnalis, Melampus carolinus*; and crutaceus *Latreutes antiborealis, Eurytium tristuni, Eurypanopeus transversus, Panopeus chilensis, P. purpureus, Callodes gibbosus, Macrocoeloma villosum, Notolopas lamellatus, Pinnotheres angelicus, Glyptograpsus impressus, Sesarma angustum, S. aequatoriale, Sholometopus occidentalis, S. rhizophorae* (Prahl et al., 1990; Alvarez-León, 1993). On both coasts, the crab *Aratus pisonii* is one of the most typical and represented species.

Many mangrove areas, due to the accelerated destruction of inland forests in the Pacific and Caribbean coasts of some countries, have become important sanctuaries and migratory routes of various species, which otherwise would be threatened to extinction. They are also important as refugee for many locally or even regionally threatened species such as *Tigrisoma mexicanum, Procyon cancrivorus punibus, Dendroica petechia, Crocodylus acutus, Caiman crocodylus* (Hernández-Camacho, 1976).

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