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Coherence of Conservation and Development Policies of Coastal and Marine Protected Areas in West Africa
Cohérence des politiques de conservation et de développement des aires protégées marines et côtières en Afrique de l'Ouest
Coerência das politicas de conservação e de desenvolvimento das áreas protegidas marinhas e costeiras na Africa Ocidental

BIBLIOGRAPHY ON MARINE PROTECTED AREAS

General and West African references

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18. MANGROVE

Galat, G., & Galat-Luong, A. (1976). La colonisation de la mangrove par *Cercopithecus aethiops sabaeus* au Sénégal. *In*: La Terre Et La Vie, Revue D'Écologie Appliquée, 30(1), 3-30.

Olsen, A. (1977). Exploitation and conservation of renewable resources of the gulfs and coastal lagoons. *In*: Aust. Mar. Sci. Bull., (60), 7.
Abstract: Spencer Gulf and St. Vincent Gulf were designated State waters in the South Australian Colonization Act 1834 and this provision was upheld in a recent High Court Decision (1977). Within the hypersaline (to 50%) high temperature (to 26-degree-C) aquatic environments in the upper peripheral sections of the two Gulfs are dominant white mangrove (Avicennia) - seagrass (Posidonia) communities grading upwards through mud and sand flats to subtidal seagrass - Pinna (razor shells) zones before reaching the deeper Pinna-sponge infauna associations in the channels. Aquatic reserves have been proclaimed to conserve these ecosystems and three new large reserves are in final stages of proclamation. Commercial catches of scale fish (whiting, schnapper and garfish) total 1-. -5 million kg and account for 46% of the total S. A. scale fish landings. Aquaculture of the Pacific oyster (Crassostrea gigas) is practised in the open waters and in man-made lagoons. A prawn culture centre has also been established. Pollution of the marine environment is localised to main population centres, sewage contributing the largest volume of fresh water to the system. Industry is mostly of the 'dry' type with minimum freshwater discharges due basically to lack of fresh water in the semi-arid environment of South Australia. Iron-, zinc- and lead-concentrate dusts constitute the basis of heavy metal pollutants at industrial ports. In this overview of the exploitation and conservation of the renewable aquatic resources of the two Gulfs, the responsibility of the resource manager for the proper use of the common property resources of these waters for the benefit of the whole community is necessary.

Dupuy, A. R., & Verschuren, J. (1978). Note sur les oiseaux, principalement aquatiques, de la région du Parc National du Delta du Saloum (Sénégal). *In*: Gerfaut Giervalk, 68(3), 321-345.
Abstract: The Saloum Delta National Park was recently created on the coast of Senegal, south-east of Dakar. It encompasses the most typical habitats of the Saloum River delta and of the coastal islands which are briefly described here. Mangroves predominate. Records made in the park, mostly in April and May 1977, are discussed. The Grey-hooded Gull, Larus cirrocephalus-, breeds in large numbers. Palearctic migrants are abundant. Various general topics, relative abundance of species, migrants and residents, local movements, predation, are examined. Human influences and conservation measures are considered.

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Diop, E. S. (1980). Vasières à mangrove, tannes et cordons sableux des îles du Saloum (Sénégal) : aspects sédimentologiques et minéralogiques. *In*: Bulletin De L'Ifan, Tome 42, Serie A(1), 26-69.
Abstract: Le présent article se propose d'étudier par la sédimentologie (granulométrie, analyse mécanique des sols, étude aux rayons X de la fraction argileuse de quelques échantillons...) les grandes unités géomorphologiques de la zone estuarienne du Saloum. Les observations

effectuées dans ce travail portent également sur l'étude des sols des différents taxons par le relevé de profil caractéristiques, et de la végétation, par l'établissement de transects représentatifs. Une étude succincte du réseau hydrographique du Saloum est abordée en introduction, de même que le contexte géologique et l'évolution au quaternaire récent des îles dans la troisième partie de ce travail

Bryceson, I. (1981). A Review of Some Problems of Tropical Marine Conservation With Particular Reference to the Tanzanian Coast. *In*: Biological Conservation, 20(3), 163-171.
Abstract: The productivity, diversity and susceptibility to stress of tropical marine communities are compared with those of temperate marine communities. The question of the importance of conservation is raised. The applicability of island biogeographical theories in relation to the design of marine reserves is briefly reviewed. It is suggested that the contention that conservation areas should always consist of the largest possible single area is not necessarily correct for the tropical marine environment. Conservation problems of particular habitats within Tanzanian coastal waters are detailed with special reference to the following: coral reefs, rocky intertidal platforms, cliffs, sandy beaches, sandy-muddy tidal flats, seagrass beds, mangroves, estuaries and small islands. The plight of some endangered species is discussed. Conclusions are drawn regarding the present status of marine conservation in Tanzania.

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Abstract: The Indonesian Constitution, which is the basis for the management and utilization of Indonesia's natural resources, provides that the "land and water, and the natural resources contained therein, shall be controlled by the state and utilized for the greatest feasible prosperity of the people. " The most challenging problem for Indonesia is the need to support its rapidly growing population. This is a strong incentive to manage its limited natural resources efficiently. A five year program for coastal area resource use management should have among its objectives the establishment of: environmental quality standards; national laws implementing international conventions for the protection of the environment; marine parks; a national contingency plan for oil spill cleanup; a research program on maximum sustainable yield of mangrove forests; a monitoring program for environmental quality; and more employment possibilities in the coastal zone

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Gouleau, D., Kalck, Y., & Lucas, J. (1982). Cristaux d'hydroxide d'aluminium neoforme dans les sediments actuels des mangroves du Sénégal (Sine Saloum et Casamance). *In*: Mem. Soc;Géol. - France, 147-154.

Marius, C., & Lucas, J. (1982). Evolution géochimique et exemple d'aménagement des mangroves au Sénégal (Casamance). *In*: Oceanologica Acta, 4, suppl. (n° spécial), 151-160. Notes: Actes du Symposium International sur les lagunes côtières, SCOR/IABO/UNESCO, Bordeaux,8-14 sept. 1981
Abstract: The mangroves of Senegal are limited to the inlet of the Casamance - a river with very low discharge - and to the Sine-Saloum. The mineralogical and geochemical analysis of sediments (derived from 30 deep bore-holes) shows the thickness of the mangrove substrate, which overlies the continental terminal formation. Kaolinite and smectite account for over 90% of the clay fraction. The former is derived from the continental terminal whereas the latter is of marine origin. The chemical composition of the mangrove sediments is remarkably stable and clays play an overwhelming role in the preservation of organic matter and pyrite. Since 1968, a drought in Senegal has caused an important increase in the salinity levels of streams and water-tables; a considerable modification of vegetation zones in the Casamance, especially manifest in the extension of bare flats locally known as 'tannes' at the expense of mangroves and marked changes in the morphology and geochemistry of mangrove soils. Compared to most mangrove areas in the humid tropics, mangroves in Senegal are characterized by a very fragile equilibrium

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Abstract: Malaysia's 650,000 hectares of mangroves are under the jurisdiction of the various State Forest Departments. Some 20 percent of the total has been lost through cutting for the wood-chip industry in the last 20 years. Another 20 percent has been earmarked for possible aquaculture development in Peninsular Malaysia. A comparison between sustained yield management for forestry and conversion to aquaculture shows that aquaculture development is economically precarious. A conservation plan involving sustained yield management and the establishment of mangrove national parks is suggested. Seed materials from the national parks will ensure genetic vigor for sustained yield management

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Habibullah-Khan, M. (1984). Marine intensive tourism in ASEAN countries. Proceedings Of The Pacific Congress On Marine Technology, Honolulu, Hawaii, April 24-27, 1984. Chap. 10, (p. MRM5). Manoa, HI USA. Hawaii: Marine Technology Soc. Notes: Summary only. **Abstract:** This study intends to make a survey of the various tourist resorts in the coastal areas of ASEAN countries with particular attention to Sentosa and St. John's islands in Singapore, Phuket, Samui and Pattaya in Thailand, Penang in Malaysia, Sombrero Park in the Philippines, and Bali in Indonesia. Demand for marine-based tourism in this region depends on a number of factors. These include tourist's income, volume of sea-borne trade in relation to total trade, cost of travel by sea in relation to airfare, relative prices in different countries, degree of marine pollution, etc., as well as various other social, political and demographic factors. A marine intensive tourist industry depends on a well-preserved enviroment and is therefore often in conflict with other marine resource users. The introduction of pollutants into seas by petroleum hydrocarbons and other sources is disastrous for water-based tourist resorts. The recreational activities (sports diving, collection or aquarium fish, shells, corals, etc., dumping of non-biodegradable rubbish) of tourists have caused ecological damage in many countries. Expanding tourist centers in coastal belts have had adverse effects on fisheries, aquaculture, mariculture and mangroves as well. The proposed study will attempt to uncover these

conflicting uses of marine resources with special reference to ASEAN countries.

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Abstract: Following an account of the geography and history of Western Samoa, details are given of the country's fisheries. Sea tenure, limited access and traditional management are considered. Pressures on the coastal resources include: dynamite fishing, fish poisoning, manual destruction of corals, soil erosion, industrial and waste disposal and pesticides, crown of thorns starfish, over fishing, cutting of mangrove trees, and dredging. A brief examination is made of fisheries related regulations, marine reserves and mariculture

Chauveau, J. P., & Laloë, F. (1985). La pêche maritime artisanale dans les îles du Saloum. Bilan provisoire. L'Estuaire Et La Mangrove Du Sine-Saloum. Atelier Régional UNESCO-LCOMAR Tenu à Dakar (Sénégal) Du 28 Février Au 5 Mars 1983. (Report No. 32). Paris: UNESCO.

David, G. (1985). Peche de subsistance et milieu naturel: Les mangroves de Vanuatu et leur interet halieutique. *In*: Notes Doc. Oceanogr., (13), 67 pp. Notes: Mission Orstom Port Vila. Port Vila Vanuatu
Abstract: The mangrove of Vanuatu belong to the Indo-Pacific kind which finds its source in Malaysia. Large wooded areas can be found on 9 islands, namely Hiou Vanua Lava, Mota Lava and Ureparapara in the north, Malekula, Epi, Emae and Efate in the central region and Aniwa in the south. The establishment and development of mangroves require light soils and sheltered sites, away from the surf and trade winds which influence the swell forces on the shores. The 110 tree species include Rhizophoraceae (Rhizophora, Bruguiera and Ceriops, Sonneratiaceae (Sonneratia), Combretaceae (Lumnitzera littorea) and Verbenaceae (Avicennia marina). The fauna in mangroves consists essentially of marine life: mollusks, snails and crustaceans. The salt waters are full of fishes. The significance of mangroves for sea life is triple: it serves as protection, source of nourishment and as a fertilizer. From the fisherman's point of view, they represent a source of aquatic reserves over a small area, and are easily exploited.

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Barusseau, J. P. et al. (1986). Conséquences sédimentologiques de l'évolution climatique fini-holocène (100-1000 ans) dans le Delta du Saloum (Sénégal). *In*: Océanographie Tropicale, 21(1), 89-98. Notes: (Sedimentological consequences of the recent climatic evolution in the Salum Delta (Senegal)
Abstract: The Sine-Saloum delta is located in a marginal situation between the sahelian and sudanian climatic zones. Deltaic environment is composed of major channels opened to the sea (Salum, Diombose and Bandiala), interconnecting channels, tidal flats covered by mangrove, bare surfaces - particularly in the North - named 'tannes'. The distribution of the vegetal formation emphasizes a recent drastic change in the environmental conditions. Two older physical factors show also this change. First the dust falls have been increasing during the last ten or fifteen years. They have been studied in five stations from Nouakchott in Mauritania to Ziguinchor in the South Senegal. The grain size distribution of the particles is a silt with a trend to fine sands. The current and salinity patterns also point out the clear influence of dryness. From current-meter measurements, an excess of tidal inflow over outflow is seen.

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Abstract: South Dakar Senegambian estuaries are subject to an unusual hydrodynamical regime caused by weak or absent run-off. In the Salum delta, each distributary lacks fresh water during most of the year. Only the tidal flows are responsible for geomorphological and sedimentological effects. The current distribution shows a net discharge upstream due to the extensive evaporation and evapotranspiration in mangrove swamps and tidal flats. Consequently the salinity is always higher towards the river than near the sea. A high salinity bottom layer suggests the occurrence of a supersaline wedge of reverse sense to the salt wedge of a normal estuary. Such an inverse pattern is similarly displayed by sedimentological features

(double upstream turned spits) and by the external location of the turbidity maximum. A coherent reverse estuary model is suggested from field observations

Boulon, R. H., & Dammann, A. E. (1986). Assessment of fish and shellfish stocks produced in the Biosphere Reserve. *In*: Res. Rep. Virgin Islands Biosphere Reserve, (10), 46.
Abstract: 19 Naturally occurring and one man-made benthic community habitat types are described in terms of the commercially important fish species assemblages found occurring there. Marine habitat types were mapped for all of St. John from National Oceanographic Survey aerial photographs and groundtruthed by divers from Jan to May 1984 to determine accuracy of mapping and to describe each habitat in detail. Fish species assemblages are determined using a random point, visual census technique which appears to be quite accurate. Results indicate that each benthic habitat type can be distinctly described in terms of its unique fish species assemblage and life history function. The life history function is viewed as a continuum primarily related to distance from shore and depth with habitats like mangrove shoreline and back reefs. Habitats with greater structural complexity tend to contain a greater number of species

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Abstract: 19 Naturally occurring and one man-made benthic community habitat types are described in terms of the commercially important fish species assemblages found occurring there. Marine habitat types were mapped for all of St. John from National Oceanographic Survey aerial photographs and groundtruthed by divers from Jan to May 1984 to determine accuracy of mapping and to describe each habitat in detail. Fish species assemblages are determined using a random point, visual census technique which appears to be quite accurate. Results indicate that each benthic habitat type can be distinctly described in terms of its unique fish species assemblage and life history function. The life history function is viewed as a continuum primarily related to distance from shore and depth with habitats like mangrove shoreline and back reefs. Habitats with greater structural complexity tend to contain a greater number of species

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Vincke, P. P., & Leung Tack, D. K. (1986). Le macrobenthos des milieux de mangrove : inventaire et perspectives d'exploitation : le cas du fleuve Saloum et du flauve Casamance au Sénégal. *In:* H. Dost Selected papers of the Dakar symposium on acid sulphate soils (3e symposium international sur les sols sulfatés acides, 6-11 janvier 1986, Dakar). (p. 251). Wageningen: ILRI.

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Abstract: The mangrove areas of Casamance and Guinea-Bissau are discussed. An account is given of their physical geography, estuarine ecosystem, land use and social environment, examining factors causing change. Development options, recommendations and mitigative measures are also considered. (Published in cooperation with Societe d'Ecoamenagement, (np); Leiden Univ. (Netherlands). Cent. for Environmental Studies.)

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Abstract: A draft is given of the 1987 Guadal Canal Province Fisheries Ordinance. It contains the following 18 sections: 1) Short title and commencement; 2) Interpretation; 3) Development of Provincial fisheries; 4) Procedures for the approval of fisheries research and development projects; 5) Agreements with customary fishing right owners; 6) Development leases over customary rights areas; 7) Limits of customary fishing rights; 8) Recording of customary fishing rights; 9) Applications to local courts; 10) Management measures; 11) Endorsement of licences; 12) Fish aggregating devices; 13) Marine reserves; 14) Mangroves; 15) Live fish; 16) Pollution of Provincial waters; 17) Enforcement; and 18) Delegation of powers

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Abstract: A draft is given of the 1987 Temotu Province Fisheries Ordinance. It contains the following 19 sections; 1) Short title and commencement; 2) Interpretation; 3) Development of Provincial fisheries; 4) Procedures for the approval of fisheries research and development

projects; 5) Agreements with customary fishing right owners; 6) Development leases over customary rights areas; 7) Limits of customary fishing rights; 8) Recording of customary fishing rights; 9) Applications to local courts; 10) Management measures; 11) Endorsement of licences; 12) Fish aggregating devices; 13) Marine reserves; 14) Mangroves; 15) Powers of Area Councils; 16) Live fish; 17) Pollution of Provincial waters; 18) Enforcement; and 19) Delegation of powers

Saenger, P. (1987). A reconnaissance account of the Rodney Island fringing reef and associated marine communities, Shelburne Bay. *In:* Fringing Reef Workshop. Science, Industry And Management. Proceedings Of A Workshop Held At Arcadia Resort, Magnetic Island, Australia, October 23 25 1986. Townsville Australia: Great Barrier Reef Marine Park Auth
Abstract: Field work and Landsat imagery data show 4 distinct marine communities to exist around Rodney Island: 1) shoreline mangroves; 2) coral fringing reefs; 3) intertidal sandflats; and 4) soft bottom benthic communities. Each of these communities is described briefly.

SECA, S. S. -A. (1987). Mangroves d'Afrique et de Madagascar. Protection et mise en valeur. Gambie, Sénégal et Guinée Bissaü, Guinée, Bénin, Ghana, Nigeria, Cameroun, Gabon, Madagascar. Vol. 3 volumes : (p. 183). [s. l.]: SECA; Société d'Eco-Aménagement; CML;Centre d'Etudes de l'Environnement de l'Université de Leyde. Notes: Vol 1 : 100, Vol 2, annexes : 83, Vol 3, 8 fasc, études de cas

Agbogba, C. (1988). La mangrove de Toubacouta (Sine Saloum-Sénégal) : quelques observations sur les termites. *In:* UNESCO, & Division des Sciences Ecologiques. Programme Man and Biosphere Ecologie d'un écosystème spécifique à usage multiples : la mangrove, (cours de sensibilisation, 1-6 décembre 1986, Dakar, Toubacouta). (pp. 71-78). Paris: Unesco.

Bâ, M. (1988). La mangrove de Toubacouta (Sine Saloum, Sénégal); usages multiples, aspects socio-économiques et culturels de la mangrove. *In:* UNESCO, & Division des Sciences Ecologiques. Programme Man and Biosphere Ecologie d'un écosystème spécifique à usages multiples : la mangrove (Cours de sensibilisation, Dakar Toubacouta, 1-6 décembre 1986). Rapport final. (pp. 95-99). Paris: Unesco/MAB.

Bojos, R. M. Jr., & Vande Vusse, F. J. (1988). Artificial reefs in Philippine artisanal fishery rehabilitation. *In:* Report Of The Workshop On Artificial Reefs Development And Management. Penang, Malaysia, 13 18 September 1988. Manila (Philippines): ASEAN/UNDP/FAO Reg. Small Scale Coastal Fisheries Development Proj.
Abstract: Philippine coastal fishery harvests have been declining because of overfishing by 900,000 artisanal and commercial fishermen and coastal fish habitat destruction. The Central Visayas Regional Project I(CVRP I) seeks to address this problem with community organization and a series of resource management activities carried out by the fishermen. These activities included: artificial reefs constructed and placed by fishermen; mangrove reforestation and management; coral reef management with establishment of marine sanctuaries; small scale sea ranching and farming of valuable native species; and deep water fish attracting devices harvested only with handlines. The fishermen who have been blamed for much of the coastal resource degradation can become effective managers of that resource. Key elements needed for the transition are: community development workers willing to live and work in fishing villages; simple, low cost technologies that are profitable, equitable to the majority of fishermen and sound from a resource management standpoint; and a flexible regulatory framework within which communities may make equitable resource allocation decisions.

Diop, E. S. (1988). Environmental modifications, research and management in the estuaries

and mangroves of the "Southern Rivers" (West-Africa). *In:* 3rd Inter. Wetlands symposium.

Doyen, A. (1988). La mangrove à usages multiples de l'estuaire du Saloum (Sénégal). *In:* 3e Symposium International sur les Sols Sulfatés Acides, Dakar, 6-11 janvier 1986. Wageningen: ILRI *ILRI Publication):* Notes: Selected papers of the Dakar Symposium on acid sulphate soils

Leclercq, A. (1988). La mangrove de Toubacouta (Sine Saloum, Sénégal) : 'caractéristiques du bois de palétuvier rouge (Rhizophora racemosa G. F. W Meyers) '. *In:* Ecologie d'un écosystème spécifique à usages multiples : la mangrove (Cours de sensibilisation, Dakar Toubacouta, 1-6 décembre 1986). Rapport final. Paris: Unesco

Diop, E. S. et al. (1989). Modifications de l'environnement dans les estuaires et mangroves de l' Afrique de l'Ouest Phénomènes naturels ou Impacts humains. *In*: Quaternary International, 2, 73-81. Notes: XII Congress of INQUA, Ottawa, Canada. Elsevier Science

Feller, C. et al. (1989). Sur le rôle de la végétation dans le stockage du soufre dans les sols de mangrove (Sénégal). Résultats preliminaries. *In*: Soil Biology and Biochemistry, 21(7), 947-952. Notes: Upon the role of vegetation in sulfur storage in mangrove soils (Senegal). Preliminary results
Abstract: Plant organs, plant residues at different degrees of decomposition, and the surface soil (0-5 cm) of a Rhizophora mangrove in Saloum Island (Senegal) were analyzed for total C, N, S and amino acid content and for sulfur isotopical composition (delta super(34)S). These preliminary results emphasize the possible role of vegetation (roots and leaves) on S storage in mangrove soils

United Nations Environment Programme. (1989). Coastal and marine environmental problems of the United Republic of Tanzania. (p. 120). Nairobi (Kenya): United Nations Environment Programme.
Abstract: The Government of the United Republic of Tanzania approached UNEP in late 1987 with a request for assistance in assessing the coastal and marine environmental problems of the country and in drawing up a national action plan for the protection, management and development of its marine and coastal environment. The report consists of a summary describing specific coastal and marine environmental problems of the United Republic of Tanzania such as, coral reef destruction, mangrove cutting, fisheries over-exploitation and unnecessary intrusion in and disturbance of marine reserves. This summary is based on six sections on various regions of the United Republic of Tanzania, with their findings and recommendations; and of a proposed Action Plan for the protection, management and development of the marine and coastal environment of the United Republic of Tanzania.

Polunin, N. (1990). Marine regulated areas: an expanded approach for the tropics. *In*: Resource Management and Optimization, (7), 28-299.
Abstract: Protected areas such as national parks and nature reserves combat environmental problems only in so far as they preserve designated sites from further damage. They scarcely solve such underlying problems as mangrove destruction, the dynamiting of coral reef or over-fishing. In a broader view regulations related to areas should nevertheless be a major mode of conservation. Various types of regulation other than strict protection may in any case be more appropriate to the coastal zones of many tropical countries. A realistically designed regulated area should be planned with particular objectives in mind, and deal most of all with problems such as those of over-fishing, population replenishment, and conflicts between fisheries and various users of single ecosystems. However, there exist limitations to implementing this approach. Poor knowledge of larval recruitment patterns as yet precludes satisfactory design of

replenishment areas. The multi species complexity of tropical fisheries makes simple management measures inadequate in many ways. There is limited knowledge of how certain beneficial ecosystem functions are maintained naturally. Such knowledge gaps will not be filled quickly, however, interim measures may nevertheless be feasible. Existing regulated areas may offer a focus for exploring the design of potential replenishment zones. There is little evidence yet that traditional marine reserves can contribute to modern management to any great extent.

Sarr, A. (1990). Contribution à l'étude écologique et socio-économique de la mangrove du Sine-Saloum. INADER/Centre Universitaire de DSCHAMG, Cameroun.

Eid, E. -M. E., & Fawzi, M. A. (1991). Egyptian approach towards appropriate use of coastal zones on the Red Sea. *In:* T. Goda, & al. (eds), Int. Conf. on the Environmental Management of Enclosed Coastal Seas '90: EMECS '90, Kobe, Hyogo Prefect. (Japan), 3-6 Aug 1990. Vol. 23 (pp. 331-337). [s. l.]: [s. n.].
Abstract: Environmental management and appropriate use of coastal zones in Egypt is one of the major challenges facing Egypt. This is a natural outcome of its strategic geographical location straddling both the Mediterranean and the Red Sea which constitute two of the major enclosed coastal seas in the world. Therefore, the problem of the protection of the marine environment in the Egyptian coastal zones has received an early and serious concern by the Egyptian authorities. Due to the repeated and lasting occurrence of oil pollution on the shoreline of the gulf which endanger both the high coral diversity and mangroves which are equally valuable and in need of protection, oil pollution combating arrangements are being established at the entrance to the Gulf of Aqaba. This paper aims to illustrate the Egyptian approach in the coastal zone management, with special emphasis on the coastal zones of South Sinai adjacent to the Gulf of Aqaba.

Wetherell, V., & Nielsen, A. (1991). Biscayne Bay Card Sound: Aquatic preserve management plan. (p. 184). Tallahassee (USA). Florida Dep. of Natural Resources, Bur. of Sumerged Lands and Preserves.
Abstract: Biscayne Bay-Card Sound Aquatic Preserve is located in Monroe County and covers approximately 17,000 acres of seagrass meadows, hard bottom communities and mangrove wetlands. The preserve is characterized as a relatively pristine, shallow lagoon system of the northern Florida Keys and southern Biscayne Bay. The estuarine environment provides habitat for a wide variety of juvenile and adult marine species. The preserve encompasses critical habitat for the endangered West Indian manatee, and is particularly recognized as one of the only remaining habitat areas for the American crocodile. The terrestrial and marine environments offer valuable habitat for more than 100 plant and animal species that are rare, threatened, endangered or species of special concern. The preserve offers water oriented recreational opportunities to the metropolitan areas of Miami and south Florida, as well as the Keys. Impacts to the resources include propeller and grounding damage to grassbeds, extended boat anchoring which shades grassbeds, fishing and marine life collecting which introduce gear and chemicals that impact species. Development is also a growing threat to the preserve, particularly from developments on north Key Largo and Pumpkin Key.

[Anon.]. (1992). Mangroves d'Afrique et de Madagascar. (pp. 273, ill. + bibliogr. + tabl. + graph. + photo + n. b.). Bruxelles (BEL); Luxembourg (LUX): CECA; CEE; CEEA.

Bojos, R. M. Jr. (1992). Territorial use rights in fisheries: Policies and strategies for coastal area management. *In:* Policies and issues on Philippine fisheries and aquatic resources Proceedings of the Roundtable Discussion of Philippine Fisheries Policies, 12-13 December 1989, Department of Science and Technology, Bicutan, Taguig, Metro Manila and the

Workshop on Territorial Use Rights in Fisheries, 26 November 1991, Bureau of Soils and Water Resources Management, Diliman, Quezon City, Metro Manila. Los Banos, Laguna Philippines: PCAMRD Notes: Workshop on Territorial Use Rights in Fisheries, Diliman, Quezon City, Metro Manila, Philippines, 26 November 1991. Received 1996.
Abstract: The Central Visayas Regional Project (CVRP I) addresses the problems of declining productivity and rural poverty caused by continuing degradation of the region's natural resources. The project is designed to stabilize and improve the resource base through community based resource management thereby developing local capabilities to manage area development. This begins at the 'barangay' (village) level to generate employment opportunities in the rural areas. CVRP I recognizes the fishermen as the real day to day managers of the coastal resources. An analysis of the fishermen's present situation reveals that fish stocks especially those near the shore are heavily exploited, resulting in declining harvest and profitability. Strategies were developed to make coastal fishing opportunities more profitable. The strategies were: (1) restoration and management of the highly productive nearshore fish producing habitats such as coral reefs, mangroves and sea grass beds by the fishing community; (2) development of low overhead fishing and sea ranching opportunities allowing more fishermen to earn more profits from limited marine stocks; and (3) utilization of community based mechanisms through regulation of different fishing gears. Implementation of these strategies began in July 1984 at the four Central Visayas sites. Fishermen were assisted in implementing a series of resource management activities which provided the basis for the development of village, municipal and provincial level coastal resource management programs. Activities implemented by fishermen are: (1) family managed artificial reef clusters; (2) protection and management of coral reefs by coastal communities including the establishment of municipal marine sanctuaries; (3) mariculture on protected and managed reefs; and (4) local control of illegal and destructive fishing methods. The protection and management of coral reefs by coastal communities were creating many new opportunities for the ranching and farming of a wide variety of native marine life. There is however, a pressing need for government to provide the promised regulatory framework to allow community based resource management to prosper. Such framework needs to be flexible and allows the coastal communities to adopt basic strategies suitable to local conditions. Key among these are regulations to: (1) allow municipal licensing of family managed artificial reef clusters; (2) provide for the creation and management of municipal marine sanctuaries; and (3) provide for regional level approval of municipal fishing ordinances. All of these were promised by the government in the 1983 Memorandum of Agreement between CVRP I and the then Ministry of Agriculture (now Department of Agriculture)

Clayton, D. (1992). Spotcheck: Updates on protected area issues (Solitary Islands Marine Reserve). *In*: Parks, 3(1), 40-41.
Abstract: Solitary Islands Marine Reserve off Coffs Harbour, is situated 600 km north of Sydney, New South Wales (NSW), Australia. It covers some 100,000 ha of rich marine and estuarine habitats and is the first marine protected area in the country to cover a complete succession of the coastal aquatic environments surrounding islands and headlands and including beaches, off-shore rocky and coral reefs, and estuaries. A significant biological diversity is attributed to a bio-geographic overlap of aquatic communities. A warm current from tropical waters mixes with a cooler southern current resulting in a fascinating mix of corals and fish from the Great Barrier Reef living with species from as far south as Tasmania. Indeed many species occurring in the Reserve are situated at their geographical extreme; the red mangrove Rhizophora stylosa occurs here at its southernmost location in the world.

Communauté Européenne. (1992). Mangrove d'Afrique et de Madagascar. (p. 273p). Luxembourg: Office des Publications Officielles des Communautés Européennes.

Diop, E. S. (1992). Mangroves of Africa, Status and management. *In*: Mangroves ISME Newsletter, (5), 6-8.

Cormier-Salem, M. C. (1993). Présentation du programme Dynamique et Usages de la Mangrove dans les pays des rivières du sud. *In:* C. Chaboud ((éd.)), Dynamique et Usages des Ressources Renouvelables. (p. 219). Montpellier : Orstom//DURR.

Diaw, A. T. (1993). Géographie des terrains salés et nus de mangrove : la problématique des tannes. *In:* A. T. Diaw, M. D. Thiam, P. Bouland, P. S. Diouf, L. A. Lake, M. A. Mbow, P. Ndiaye, & M. D. Thiam (Coord.), Gestion des ressources côtières et littorales du Sénégal: Actes de l'Atelier de Gorée du 27-29 Juillet 1992. (pp. 43-61). Gland, Suisse: UICN.

Diop, E. S. (1993). Les mangroves du Sénégal et de la Gambie. Conservation et utilisarion rationnelle des forêts de mangroves de l'Amérique latine et de l'Afrique. (pp. 22-38). [s. l.]: [s. n.].

Diop, E. S. (1993). Status of Mangrove Ecosystems in Africa. *In*: ISME Mangrove Ecosystems Proceedings, (1), 21-22.

Diop, E. S., Tamoikine, M. Y., & Pandaré, D. (1993). Fisheries resources assessment in the West African mangrove ecosystems, the role of the Ichthyoplankton studies. *In:* The "Okinawa mangrove session", 7 th Pacific Science Inter-Congress.

Smith, A., & Berkes, F. (1993). Community-based use of mangrove resources in St. Lucia. *In* : International Journal of Environmental Studies, 43(2-3), 123-131.
Abstract: The sustainable use of mangrove forests can effectively contribute to their conservation. The experience with an integrated conservation-development project in St. Lucia showed that charcoal producers using mangrove fuelwood resources in a Marine Reserve Area have successfully changed their harvesting practices, reversing a trend of mangrove destruction. The conditions under which this change occurred included strengthening the organization of local users and their resource-use rights, and building a community-based management system, leading to the avoidance of open-access conditions. Surveys of the mangrove, undertaken before and after management intervention, showed that while the mean stand diameter of the fuelwood trees did not change significantly, there was an increase in the density of stems and in total basal area of timber

UICN. (1993). Les mangroves en Afrique de l'Ouest : éléments de stratégie pour un développement durable. Report of UICN for BDA Based on Abidjan Workshop. S. L. : UICN/African Development Bank.

Visser, N. M. (1993). Wetlands and tourism. *In:* Wetlands of Kenya. The KWWG Seminar on Wetlands of Kenya, Nairobi (Kenya), 3-5 Jul 1991. Gland (Switzerland): IUCN
Abstract: Five wetland oriented actions are recommended to develop and safeguard the financial resources derived from tourism in Kenya. These are to: improve the quality of the sewage water discharged into Lake Nakuru; stop the inflow of agrochemicals into lake Naivasha and let an Environmental Impact Assessment form the basis of the decision whether or not to remove water from Lake Naivasha to supply drinking water to Nakuru town; accelerate anti erosion activities around Lake Baringo; Include mangroves, that now falls under Forestry Department, in the KWS management of marine protected areas; make the Tana River Delta a protected area, including a large area of freshwater wetland north of the river and develop tourism infrastructure

Bouju, S. (1994). Le morcellement identitaire des populations littorales: quelques éléments de l'histoire du peuplement. *In:* Dynamiques et usages de la mangrove dans les pays des rivières du Sud (du Sénégal au Sierra Leone). (pp. 131-138,). Paris: Orstom, coll. Colloques et Séminaires

Carter, J. et al. (1994). Creation of the Hol Chan Marine Reserve in Belize: A grass-roots approach to barrier reef conservation. *In*: Environmental Professional, 16(3), 220-231.
Abstract: The mesoamerican nation of Belize is endowed with a true global treasure-its magnificent barrier reef ecosystem. However, in recent years rapid economic growth in tourism and fishing and increasing human population have placed unprecedented demands on these once pristine coastal and marine ecosystems. The degradation of marine habitats and subsequent loss of biodiversity threatens the long-term biological integrity of the barrier reef ecosystem and the livelihood of Belizean people who depend upon it. A common worldwide approach to the conservation and protection of shallow-water tropical marine ecosystems has been through the establishment of protected areas. In 1987, the government of Belize established the Hol Chan Marine Reserve in an effort to conserve a small but complete portion of the Belize marine ecosystem, including coral reef, lagoon, and mangrove habitats. The Hol Chan Marine Reserve has achieved a modicum of success and serves as a catalyst for the creation of other parks in the region. This paper provides information on the development and implementation of the Hol Chan Marine Reserve and discusses implications for its value as a model for other such areas proposed for the Belize Barrier Reef.

Descamps, C. (1994). La collecte des arches, une activité bi-millénaire dans le Bas Saloum (Sénégal). *In:* M. C. Cormier-Salem ((éd)), Dynamique et usage de la mangrove dans les pays des rivières du sud (du Sénégal à la Sierra Leone). Actes de l'atelier de travail de Dakar du 8 au 15 mai 1994. (pp. 107-115). Paris: Orstom.

Diop, E. S., Barusseau, J. P., & al. (1994). Document de base élaboré pour la réunion DUM "Dynamiques et Usages de la Mangrove" dans les "Rivières du Sud" 8-15 mai 1994. Dakar: ORSTOM-LEA.

Dixon, J. A. et al. (1994). Economic analysis of environmental impacts. (pp. 2, xii + 210 pp., 40 tab., 25 fig. ; many ref.). [s. l.]: [s. n.].
Abstract: This book focuses on the imposition of monetary value on the environmental impacts of economic development. Although much of the emphasis is on project level impacts, it also recognizes the importance of macro level government policies on the patterns of resource use. It contains sixteen chapters divided into two parts. The use of environmental assessment procedures, valuable at the early stages of project identification and priority setting, are discussed in chapter 2. The basic theoretical assumptions that underlie the proposed approach to valuation are then outlined in chapter 3. The techniques themselves are presented in chapters 4, 5 and 6; Chapter 4 focuses on techniques that are generally applicable to project analysis, while chapters 5 and 6 concentrate on techniques which are more difficult to apply and whose use in project analysis has therefore been limited. Chapter 5 covers selectively applicable techniques that rely on the existence of surrogate markets or the use of survey based approaches, and chapter 6 discusses the use of mathematical models, natural resource accounting, and analysis of economy-wide impacts within the broader context of economic development and environmental management. The limitations of the economic measurement of environmental impacts are discussed in chapter 7. Case studies, which illustrate complete economic analyses as well as the use of individual techniques, are presented in the nine chapters in part two. The first of these case studies examines the use of changes in the values of milk, fertilizer and firewood production to assess a watershed management and forest development project in

Nepal; the second evaluates selected mangrove management schemes in Bintuni Bay, Indonesia, on the basis of changes in productivity in mangrove-based activities including fishing, forestry and hunting; the use of the cost-of-illness approach to estimate the health costs of air pollution in Jakarta, Indonesia, is illustrated in the third case; the fourth estimates the benefits of a soil conservation project in the Loess Plateau, China; the fifth compares the cost-effectiveness of several waste-water disposal methods in the Togonan Geothermal power plant, Leyte, Philippines; the sixth the benefits for tourists and local residents of the establishment of a new National Park in Madagascar; the trade-offs between ecology and economic functions in the Bonaire Marine Park, Dutch Antilles is the seventh case; while the eighth estimates willingness to pay for improved water supply in Onitsha, Nigeria; and the final case study focuses on the priorities for setting priorities for pollution control measures in Central and Eastern Europe. The book represents an updated form of the Economic analysis of environmental impacts of development projects, published in 1988.

Sylla, M. (1994). Soil salinity and acidity : spatial variability and effects on rice production in West Africa's mangrove zone. (p. 175). Den Haag: CIP-data Koninklijke Bibliotheek.

Andersson, J. (1995). Marine resource use in the proposed Mafia Island Marine Park. (p. 34). [s. l.]: Unit for Environmental Economics, Department of Economics, Gothenburg University.
Abstract: The marine resource users in the proposed Mafia Island Marine Park include the local men, women, and children and an increasing number of outsiders, mainly from Dar es Salaam, Mtwara, Lindi, and Zanzibar. Finfish were the main marine resource, but the individual income earnings were larger for the collection of corals. Octopus fishing was the activity that involved the largest number of people; this is mainly because it can be performed by women and children. Octopus is the product that had the largest difference in buying price on Mafia and selling price in Dar es Salaam. Other identified marine resource activities of significance to the locals were shell and sea cucumber collection. These had very small or no relevance for local consumption and were sold to external markets. Identified environmentally harmful activities were coral collection, dynamite fishing, the use of destructive fishing gears, and the illegal cutting of coastal and mangrove forests. The economic incentives to burn corals for the production of lime were large. Dynamite fishing was generally considered as '~ad[1]9, but there was a discrepancy in the perception of the activity between the smaller islands included in the proposed park area. The perception among the locals towards the implementation of the park was very positive. The largest expectations among the local resource users were for the park to secure and eventually improve the productivity of their fishing grounds

Causey, B. (1995). An ecosystem approach to managing marine protected areas for sustainable use. *In:* Sustainable Financing Mechanisms For Coral Reef Conservation: Proceedings Of A Workshop, Washington, DC (USA), 23 Jun 1995. Washington, Dc Usa : World Bank
Abstract: The Florida Keys extend approximately 220 miles southwest from the southern tip of the Florida peninsula in the United States. Located adjacent to the Keys' land mass are spectacular, unique, and nationally significant marine environments, including seagrass meadows, mangrove islands, and extensive living coral reefs. These communities are the marine equivalent of tropical rain forests in that they support high levels of biological diversity, are fragile and easily susceptible to damage from human activities. Warning signs that the Keys' environment and natural resources were fragile, and not infinite, came early. In 1957, a group of conservationists and scientists held a conference at the Everglades National Park and discussed the demise of the coral reef resources in the Keys at the hands of those who were attracted there because of their beauty and uniqueness. The conference resulted in action that created the world's first underwater park, the John Pennekamp Coral Reef State Park, in 1960. Other management efforts were undertaken to protect the coral reefs of the Florida Keys. The

Key Largo National Marine Sanctuary was established in 1975 to protect 103 square nautical miles of coral reef habitat stretching along the reef tract from just north of Carysfort Lighthouse to south of Molasses Reef, offshore of the Upper Keys. In 1981, the 5. 32 square nautical mile Looe Key National Marine Sanctuary was established to protect the popular Looe Key Reef, located off Big Pine Key in the Lower Keys.

Danaher, K. F. (1995). Marine vegetation of Cape York Peninsula. (pp. 64, Includes illus., maps, 21 tables, 5 append., 85 ref.). Brisbane, Qld Australia: Queensland Department of Primary Industries.
Abstract: A project was undertaken to obtain baseline information on the distribution of mangrove and seagrass on Cape York Peninsula for the purpose of developing an appropriate strategy for management of fisheries resources. A system of Reserves is in place, but the boundaries of reserves and the need for additional reserves in areas of high habitat value are under continuing review. The mangrove communities were mapped on a computer using digital imagery from the Landsat Thematic Mapper satellite. The seagrass maps were produced from dive and boat surveys conducted by the Northern Fisheries Centre, supplemented by colour aerial photography. A number of recommendations regarding the boundaries of reserves, and the establishment of Fisheries Reserves, are derived from the results.

Diop, E. S. et al. (1995). Observations à propos des facteurs limitants le développement de la mangrove dans le Saloum (île du Gandoul). Rapport Final De L'EPEEC. Dakar: [s. n.].

Enright, J. (1995). Aquaculture degrades Khao Sam Roi Yot National Park. *In*: Coast. Manage. Trop. Asia, (4), 24-25.
Abstract: Khao Sam Roi Yot National Park, located approximately 300 km southwest of Bangkok, on the Gulf of Thailand, has 10 distinct habitat zones including mixed deciduous and secondary forests, tidal mudflats, mangroves, sand beaches, scrub, saltflats and cultivation, brackishwaters and prawn ponds, paddy fields, 5 offshore islets, and open sea. The status of 'National Park' has not been enough to protect the area from the onslaught of the black tiger prawn (Penaeus monodon) farming boom. Large scale encroachment by prawn farms has occured, mainly allowed by the fact that park boundaries have never been clearly demarcated in certain regions. The park has lost substantial amounts of habitat including mangrove, reedbed marsh and tidal mudflats, including also the wildlife and birds. The impact of the prawn farm extends beyond the pond itself, as the saline water seeps into the surrounding soil and ground water; the waste water is sometimes released onto adjacent land where it can kill the freshwater reedbeds and grass. It is concluded that although the park has suffered greatly from the direct impact of encroachment and from secondary impact by unrestricted aquaculture growth, it is still a valuable resource worth preserving. The prawn farming industry needs to be brought under control, and transformed into a sustainable form of aquaculture. Some conservation measures are proposed

Haskell, B. D., Lindelof, E., & Causey, B. (1995). Monitoring the health of the Florida Keys National Marine Sanctuary: Research needs. *In*: Bulletin of Marine Science, 54(3), 1078.
Notes: Symposium on Florida Keys Regional Ecosystem. November 1992
Abstract: The Florida Keys National Marine Sanctuary is the first sanctuary in the Nation to encompass an entire ecosystem. It is composed of several productive and biologically diverse communities such as the coral reefs, seagrasses, and mangroves, some of which are showing signs of severe stress. Recognizing the threats to these unique resources, the President signed the Florida Keys National Marine Sanctuary and Protection Act (Keys Act) on November 16, 1990. The Keys Act calls for the protection of resources and requires NOAA to develop a comprehensive management plan. The sanctuary will be managed to allow continued,

compatible multiple uses while achieving the resource protection goals of the Keys Act. This will be accomplished through coordinated interintra agency resource protection efforts, education which promotes wise use of resources, zoning to minimize conflicts and protect biodiversity, and research designed to better understand the ecosystem. In addition to identifying research needs, the Keys Act requires that NOAA establish a long term ecological monitoring program. To successfully protect this ecosystem, NOAA must understand and monitor its health. This will require considerable input from researchers. This paper will review research needs and will propose a framework for a long term monitoring program for the sanctuary

King, M., Faasili, U., & Ropeti, E. (1995). Management strategies for inshore fisheries in tropical Pacific Islands. *In:* South Pacific Commission And Forum Fisheries Agency Workshop On The Management Of South Pacific Inshore Fisheries. Manuscript Collection Of Country Statements And Background Papers. Volume 2 (pp. 507-519).
Abstract: Reasons for declines in the stock sizes of some Pacific Island lagoon and reef species include overexploitation, the use of damaging and overly-efficient fishing practices and environmental deterioration. In many cases, these have been exacerbated or caused by inadequate knowledge and poor management practices. An examination is made of such concerns and constraints, offering also possible strategies to address them. The use of previously published data to suggest safe sustainable yields from different types of environments and relative catch rates are recommended to indicate the health of the fish stocks and the need to take appropriate action. An important strategy is to move the focus away from commercial fisheries, and concentrate on subsistence fisheries. The marine environment continues to suffer from the effects of sewage disposal, mangrove clearance, land reclamation and, particularly, siltation in lagoon systems. The use of co-management, between central governments, fisheries authorities, fishers and village communities is an important ingredient in strategies to conserve inshore fish stocks. Nationally imposed fisheries regulations are likely to be ineffective unless they have the support of the community. Innovative ways of ensuring the sustainability of fish stocks include the establishment of community-supported Marine Protected Areas within a village's usual or traditional fishing area.

Kuenen, M. M. C. E., & Debrot, A. O. (1995). A quantitative study of the seagrass and algal meadows of the Spaanse Water, Curacao, The Netherlands Antilles. *In*: Aquatic Botany, 51(3-4), 291-310.
Abstract: The Spaanse Water is a relatively turbid, 3. 19 km super(2) inland bay of virtually oceanic salinities and contains the largest seagrass, algal and mangrove areas of the Curacao Underwater Park. During 1989 and 1990, a quantitative community assessment of the larger attached flora and fauna of the seagrass and algal meadows of the bay was conducted at 151 6 m super(2) stations using a quadrat sampling technique. A total of 13 different assemblages were distinguished. Shallow assemblages were dominated by Thalassia testudinum and Halimela opuntia. As depth increased and light levels decreased, Thalassia gave way to increased coverages of especially H. opuntia, H. incrassata, Cladophora sp. and Caulerpa verticillata. In areas with significant availability of hard substrate an assemblage characterised (though not dominated) by corals was found at depths of 0-2 m, while sponges were concentrated at depths of about 4 m. The richest assemblages were found in shallow areas with high light levels and where a mix of both hard and soft substrate occurred. Assemblages with the lowest species richness were typically associated with low light intensities, soupy muds or homogeneous sandy sediments of high grain size.

Maragos, J. E., & Cook, C. W. Jr. (1995). The 1991-1992 rapid ecological assessment of Palau's coral reefs. *In*: Coral Reefs, 14(4), 237-252. Notes: Special Issue: Science and

Management.
Abstract: At the request of the Palau and US governments, a team of 30 scientists under the leadership of the Nature Conservancy completed a rapid ecological assessment (REA) of nearshore marine resources in Palau in 1992. The REA provided ecological input to Palau's ongoing master plan for economic development and identified 45 marine sites worthy of special protection. The REA relied on previous literature, 1992 aerial photography, interviews, and field observations. A combination of qualitative and quantitative techniques were used to assess stony corals, other reef invertebrates, reef and shore fishes, macroscopic algae, seagrasses, sea turtles and other marine organisms. The REA covered a variety of coral reef habitats including beaches, seagrass beds, fringing reefs, lagoons, passes, channels, reef holes, patch and pinnacle reefs, barrier reefs, atolls, submerged reefs, mangroves, and "rock" islands. Major stresses to Palau's coral reefs include sedimentation from soil erosion, overfishing, and damage from periodic storms and waves. Minor stresses include dredge-and fill activities, sewage pollution, anchor damage, tourism use, ship groundings, aquarium fish collecting, and minor crown-of-thorns (Acanthaster) infestations.

Mndeme, Y. E. S. (1995). Mafia marine resources in peril. *In*: Naga, 18(2), 12-13.
Abstract: The rich marine resource of the Mafia District, Tanzania, especially its coral reefs and mangroves, are in danger of collapse. The proposed marine park faces chronic problems of dynamite fishing and coral mining. The Mafia fisheries resources and the importance of coral reefs are presented together with proposed measures to rescue the Mafia marine environment.

Soumaré, A. et al. (1995). Observation à propos des facteurs limitant le développement de la mangrove dans le Saloum, Îles du Gandoul. Rapport Final. Dakar: Equipe Pluridisciplinaire pour l'Etude de Ecosystème Côtiers (EPEEC).

Twilley, R. R. et al. (1995). Mangrove systems. *In:* Global biodiversity assessment. (pp. 357-393). Cambridge, UK: Cambridge University Press

Cormier-Salem, M. C. (1996). Les littoraux à mangrove des régions fragiles ? Eléments de reflexion à partir des conclusions des programmes DUM (Dynamique et Usages de la Mangrove dans les pays des rivières du sud). *In:* Dynamique et Usages des Ressources Renouvelables. Paris: Orstom Notes: Colloque de clôture du DURR

Diop, E. S. et al. (1996). Dynamique de la mangrove des îles du Gandoul occidental (du nord de l'île de Guissanor au sud du bolon de Niodior) (Saloum/Sénégal). Rapport Final. Dakar: Equipe Pluridisciplinaire pour l'Etude de Ecosystème Côtiers (EPEEC).

Diop, E. S. et al. (1996). Mangrove restoration through replantation in Senegal West Africa. *In*: ISME Newsletter, (17), 4-5.

Drake, S. F. (1996). The International Coral Reef Initiative: A strategy for the sustainable management of coral reefs and related ecosystems. *In*: Coastal Management, 24(4), 279-299.
Abstract: The International Coral Reef Initiative (ICRI) is a new and innovative strategy developed by countries and nongovernmental partners as a means to implement the recommendations on coral reefs and related ecosystems found in Agenda 21 and other international agreements. The ICRI uses a multilevel (international, national, regional, and local), participatory (both top-down and bottom-up) approach based on partnerships formed among many different sectors and stakeholders to promote capacity building, research and monitoring, and sustainable use and management of coral reefs and related ecosystems (mangroves and sea grass beds). The ICRI builds on the principles related to coastal zone

management and sustainable development-partnership, integration, coordination, and participation. The ICRI has been effective in creating political will and momentum among many different sectors and facilitating the development of an international agenda with priorities for coral reefs. An analysis of ICRI's effectiveness to date is provided along with recommendations for its future success.

Hartcher, M., & Shearin, J. (1996). Developing a corporate wide network for GIS. *In*: Reef Research, 6(2), 8-12.
Abstract: The use of Geographic Information Systems (GIS) at the Great Barrier Reef Marine Park Authority, Queensland (Australia) has been less than ideal, given that the Reef contains about 3,000 reefs and 1,000 islands, including vast lengths of coastline with critical habitats such as mangroves and seagrasses, sites for endangered species such as turtle and dugong and supporting a plethora of commercial activities including trawling, line fishing, tourism and recreational activities. A strong commitment by GIS users to develop coordination and standards has led to a dramatic increase in the use of information to guide decision making, accompanied by an increase in the level of conceptual understanding of GIS and spatial analysis to the level where users can develop methods to solve spatial problems. The future focus for GIS in the Great Barrier Reef Marine Park Authority should be on the coordination of data needs, modelling and reporting systems.

Ngoile, M., & Kiwia, M. A. (1996). Community participation in the development of Mafia Island marine park. *In:* O. Linden, & C. G. Lundin National Workshop on Integrated Coastal Zone Management in Tanzania, Zanzibar, (Tanzania), 8-12 May 1995. (pp. 124-132). Washington,-D. C. -USA : World Bank, Environmental Department, Land, Water and Natural Habitants Division.
Abstract: The southern part of Mafia Island hosts a great variety of natural resources and habitat types with considerable physical and biological diversity. Larvae produced within the reef system of southern Mafia is likely to contribute to the maintenance of reef related marine life, including commercial fish stocks in Tanzania and the northern Eastern Africa coastal waters. Thus southern Mafia may serve as a seed bank for an area much more extensive than Mafia itself. Threats undermining the sustainable resource use at Mafia include the recent rise in dynamite fishing, clear felling mangroves, use of illegal fishing gears, coral mining for building and lime production, anchorage damage, pollution from oil discharge and siltation and imbalances caused by changes in terrestrial run-off after deforestation in the Rufiji Delta. Marine turtles are threatened by encroachment at breeding sites and increasing numbers are caught in shark nets.

Rajasuriya, A. (1996). Marine sanctuaries and conservation of fishery resources. *In:* Report And Proceedings Of The Sri Lanka Fao National Workshop On Development Of Community Based Fishery Management. Colombo, 3 5 October 1994. 1996:
Abstract: The dwindling of coastal resources is of great concern to many developing countries. Critical habitats such as coral reefs, mangroves and seagrass beds make up the coastal ecosystems. These ecosystems are important for the well being of people, coastal communities in particular. Coastal fisheries sustain many economies, coral reef associated fisheries supply 10 to 12% of the world's total fish landings. About 90% of fish landings in tropical developing countries comes from coastal waters and supplies 40% to 95% of animal protein consumption. Human activities have begun to degrade these ecosystems. Destructive fishing methods, over harvesting, pollution and sedimentation due to unplanned land use practices are the major causes. Several countries have attempted to arrest this trend by introducing various regulations to manage resource exploitation and by declaring marine protected areas. However, measures taken to protect and manage the resources have not produced the desired results, mainly due to

the lack of involvement of the communities concerned.

Andrews, G. (1997). Development of Mafia Island Marine Park. Policy Conf. on Integrated Coastal Zone Management in Eastern Africa and Island States, Mahe (Seychelles), 23-25 Oct 1996. *In:* O. Linden, & C. G. Lundin The journey from Arusha to Seychelles: Successes and failures of integrated coastal zone management in Eastern Africa and Island States. (pp. 241-254). Washington, DC USA : The World Bank, Environmental Department. Notes: Paper also presented at: Experts and Practitioners Workshop on Integrated Coastal Area Management for Eastern Africa and Island States, 12-16 Aug 1996. Also published in: Sharing Coastal Management Experience in the Western Indian Ocean. Edited by Humphrey, S. and J. Francis, 1997
Abstract: The Mafia Island region (Tanzania) contains estuarine, mangrove, coral reef and marine ecosystems. Habitats in the area of the Mafia Marine Park (MIMP, 400 km super(2)) include hard coral dominated reefs, soft coral and algal dominated reefs, sheltered back reef systems, intertidal flats with hard and soft substrate, mangrove and coastal forests, seagrass beds, algal, sponge and soft coral subtidal beds. The fisheries around Mafia provide much of the area's subsistence protein as well as a substantial income for the community. The productivity of Mafia's marine and coastal habitats are threatened by activities that include: destructive fishing techniques, particularly dynamite fishing; over-exploitation of fisheries resources and the access to that resource; excessive coral mining for aggregate and lime production; excessive harvesting of mangroves for building and fire wood; clearing of coastal forests for agriculture and unsustainable resource use; and unmanaged tourism development. Throughout Eastern Africa, integrated conservation management and policy development has generally concentrated on terrestrial ecosystem. However, the recognised economic and ecological importance of marine and coastal environments prompted the government of Tanzania to prepare a legislative base for marine protected area by passing the Marine Parks and Reserves Act in 1994. A management plan for the Mafia Island Marine Park (MIMP) was developed in 1993 and the park was officially gazetted in April 1995. The management systems and institutional capacity for Mafia Island Marine Park are addressed

Attwood, C. G., Harris, J. M., & Williams, A. (1997). International experience of marine protected areas and their relevance to South Africa. *In*: South African Journal of Marine Science, 18, 311-332.
Abstract: Marine protected areas (MPAs) have become necessary to counter modern threats to marine biodiversity and the sustainability of fisheries. Sensitive habitats, including coral reefs, estuaries and mangroves, have been effectively protected in large MPAs, which control resource use. Protection from pollution and physical destruction by fishing gear are important functions of MPAs in tropical and temperate regions. MPAs have been used to protect endangered species and to allow population recoveries. The advantages for fishery management include maintenance of spawner biomass, improvement of yield, simplified enforcement, research opportunity, insurance against stock collapse and maintenance of intraspecific genetic diversity. MPAs can be small with narrow, focused objectives, or large with core areas, buffer zones and exploitable areas to provide an integrated management approach. A variety of design considerations, based on ecological, fishery and socio-economic conditions, is presented. Optimal size and spacing have not been extensively tested and only theoretical arguments guide the choice of how much to protect. The process of establishing an MPA can be initiated by local communities or by governmental authorities. The former has better public support, whereas the latter promises a well planned system of MPAs. Community and industry involvement in the establishment process is essential for the effective functioning of MPAs. Successful MPAs are administered by national programmes and managed according to management plans. Monitoring, communication and enforcement are integral components of

MPA management. South Africa is party to a number of international conventions which promote the designation of MPAs. Better protection of the physical marine environment, incorporation of MPAs in fishery management procedures and the management of MPAs are the major areas where South Africa can improve its marine protection

Bjorn, K., Lacerda, L. D. d., & Diop, E. S. (1997). Mangrove ecosystem studies in latin america and africa. (p. 349 + ill + cartes). [s. l.]: [s. n.]. Notes: Microfiche n° 97s0291; catalogue n° 108675

Debenay, J. P. et al. (1997). L'Ecosystème de mangrove de la Casamance (au Sénégal). *In:* K. Bjorn, L. D. d. Lacerda, & E. S. Diop Mangrove Ecosystem Studies in Latin America and Africa. (pp. 224-240). Paris: Unesco.

Diop, E. S., Kjerfve, B., & Lacerda, L. D. d. (1997). Mangrove ecosystems studies in Latin America and inAfrica. (p. 349). Paris: UNESCO ISME and US Forest Service, Dept. of Agriculture.

Diop, E. S. et al. (1997). Recent changes of the mangroves of Saloum river estuary (Senegal - West Africa). *In*: Mangroves and Salt Marshes, (1), 163-172.

Diop, E. S. et al. (1997). Recent changes of the mangroves of the Saloum River Estuary, Senegal. *In:* Mangroves and Salt Marsches 00: 1-9. Netherlands: Kluwer Academic Publishers

Diop, E. S. et al. (1997). Suivi de la station expérimentale de reboisement par la mangrove dans la lagune de la Somone (janvier 1996 mars 1997). Rapport Final De L'EPEEC. [s. l.]: [s. n.].

MacDonald, L. H., Anderson, D., & Dietrich, W. E. (1997). Paradise threatened: Land use and erosion on St. John, US Virgin Islands. *In*: Environmental Management, 21(6), 851-863.
Abstract: Rapid development and the concomitant increases in erosion and sedimentation are believed to threaten the reefs and other marine resources that are a primary attraction of St. John and Virgin Islands National Park. Average annual sediment yields from undeveloped areas were estimated from a sediment pond and a mangrove swamp as less than 20 and less than 40 tkm super(2)yr, respectively. Geomorphic evidence indicates that plantation agriculture during the 18th and 19th centuries did not cause severe erosion. Since about 1950 there has been rapid growth in roads and development due to increasing tourism and second-home development. Our field investigations identified the approximately 50 km of unpaved roads as the primary source of anthropogenic sediment. Field measurements of the road network in two catchments led to the development of a vector-based GIS model to predict road surface erosion and sediment delivery. We estimate that road erosion has caused at least a fourfold increase in island-wide sediment yields and that current sedimentation rates are unprecedented. Paving the dirt roads and implementing standard sediment control practices can greatly reduce current sediment yields and possible adverse effects on the marine ecosystems surrounding St. John

Margoluis, R., Salafsky, N., & Symington, M. (1997). Linking project design, management and monitoring in ICM projects. *In*: Intercoast Network, 29, 11-12.
Abstract: Imagine you have just been hired to be the project manager of a newly created coastal and marine biosphere reserve. Your first challenge is to facilitate a process to design the reserve in a way that will help satisfy some of the immediate needs of the people who live in and around the reserve while ensuring its conservation for future generations. In recent years, the area encompassing the new reserve has been increasingly used for the expansion of family

agricultural plots, shrimp farming, and extraction of mangroves for fuelwood, charcoal production, and construction. Likewise, foreign fishing vessels have been actively fishing in the waters inside and around the new reserve. As a responsible manager, you want to be able to target project activities as efficiently as possible to address the major threats to the new reserve and you want to be able to demonstrate just how effective your interventions have been.

Martens, E. E. (1997). KWS Coastal Wetlands Conservation Project. *In:* J. Hoorweg (ed.), Environmental management, research and training in coast province, Kenya. Chap. 1, (pp. 27-29). Nairobi Kenya : Acts Press.
Abstract: The three main coastal wetland biotopes constitute mangrove forests, intertidal seagrass beds and coral reefs. The coastal wetlands support abundant marine life, area refuge for rare or threatened species and are crucial resting and feeding grounds for resident and migratory birds. They have important interrelationships, which are the basis for biodiversity. In addition to being a centre for social, subsistence and recreational activity, wetlands also add to the economy through tourism, fisheries and fisheries products. Because of the inextricable linkage of wetlands to their surrounding systems, their conservation management must be persued in the context of an integrated approach to environmental conservation and ecologically sustainable development. The main objective of the programme is to promote and facilitate conservation and integrated management of marine protected areas and coast wetlands to safeguard the biodiversity and integrity of ecosystems and their productivity. The overall objective follows the three main goals of KWS which are biodiversity conservation, partnership and nature tourism. The coastal wetland projects, which are funded by the Netherlands government supports conservation and management activities in the marine parks and reserves along the coast. The projects give special attention to endangered species such as turtles, dugongs and also mangroves within and outside protected areas. Other wetland conservation and training programmes funded by the Netherlands are the inland wetlands project based at KWS Nairobi headquarters and training project at Naivasha Training Institute

Ong'-anda, H. O., & Mwandotto, B. A. J. (1997). Kenya Integrated Coastal Area Management (ICAM) pilot project: Bamburi-Nyali-Shanzu area, Mombasa. *In:* B. G. Rawlins, & T. M. Williams (edS), ODA/LOCS Workshop on Environmental Monitoring in the Coastal Zone, Mombasa (Kenya), 23-25 Apr 1997. (p. 1). Nottingham-UK : British-Geological-Survey. Notes: Summary only.
Abstract: The Kenyan Coast is endowed with a number of natural resources. There are coral reefs, mangrove forests, lowland and Kaya forests, and sandy beaches. These resources support a number of thriving industries ranging from the multi-million dollar tourism industry, reef fisheries and mangrove harvesting. The port town at Mombasa is also a centre of import-export and other commercial activities supporting a population close to 1. 4 million people. The dynamics of the socio-economic, cultural and ecological situations has necessitated the need for sustainable exploitation of these coastal resources. This gave rise to the first pilot study of ICAM in Kenya. Seven (7) Kenyan Coastal institutions drawn from the governmental and non-governmental agencies constituted a working team led by Coast Development Authority for implementing the ICAM pilot study. The study site, an area approximately 100 km super(2) has an interesting profile consisting of hotels, mangroves, human settlements, roads, marine park and reserve, urban market, research centre, industry and it has a sea front. The process of fact finding included verbal interviews, personal observations and verification of archive data. The resulting profile was discussed and crystallized at local and national stakeholders workshops. Seven issues were finally identified namely: The need for improved land use management; Provisions for adequate infrastructure and public services; Fresh and coastal water quality degradation; Declines in the reef fishery and the viability of artisanal fishing as livelihood; Degradation of coastal and marine habitats-mangroves, coral reefs, beaches and seagrasses;

Coastal erosion; and Increasing on-water and land use conflicts. For all these issues, short and long-term management strategies that are practical in addressing them using local resources were proposed. Some demonstration activities have been employed to amplify the benefits of ICAM to the local communities. Various stakeholders participate in the demonstration activities. To continue the evolution of ICAM process in Kenya to cover the whole of the coastline, a coastal management steering committee has been put in place to oversee the many activities which have been planned in the strategy document that will be carried out by the respective technical (working) groups according to the issues. This study is part of the wider effort to develop ICAM for the whole of Western Indian Ocean Coastal countries including the Island states

Schmidt, K. F. (1997). "No-take" zones spark fisheries debate. *In*: Science Washington, 27(5325), 489-491.
Abstract: An unusual experiment is getting underway this month on a 30-kilometer-square patch of coral reefs, sea grass meadows, and mangrove swamps off the Florida Keys. Federal officials are banning all fishing from this part of the Florida Keys National Marine Sanctuary--in order to help replenish fisheries elsewhere. The hope is that the Western Sambos Ecological Reserve, as it's called, will serve as a source of fish, larvae, and eggs that will spill over into surrounding waters to help restock populations suffering from overfishing, pollution, and heavy tourism. The reserve is the first no-fishing zone set up for this purpose in U. S. waters, but many ecologists and fisheries scientists hope it will fuel a trend. They argue that no-take reserves are crucial for preserving marine biodiversity and healthy ecosystems, and for restoring the ocean's dwindling fisheries. But although the Florida Keys reserve is finally a reality after six tumultuous years of back and forth between scientists, fishers, divers, aquarium fish collectors, local business leaders, and county, state, and federal officials, the idea that it and others like it will help enhance fish stocks is still very much a theory. Even those who support the strategy acknowledge that, in most instances, researchers don't know where many fish species spawn and how they disperse, making it difficult to pick out the best areas for protection.

Upreti, A., & Shanmugaraj, T. (1997). Gulf of Mannar Marine Biosphere Reserve. (p. 47). Tamil Nadu, India: Tamil Nadu Forest Dep.
Abstract: Biosphere reserves are protected areas of representative environment. The Gulf of Mannar is one of the marine biosphere reserves (GOMMBRE) situated along the coastline of east coast of India and Sri lanka. It is covering an area of 10,500 sq. km. and included 21 islands. The Gulf of Mannar is one of the biologically richest and important habitat for sea algae, seagrass, coral reef pearl banks, sacred chank bed, fin and shell fish resources, mangrove endemic and endangered species. Nearly 3,600 species of flora and fauna are represented here. The 21 islands and Gulf of Mannar are declared as marine national park in 1986 for the purpose of protecting marine wild life and its environment by Government of India and state of Tamil Nadu. Objectives of GOMMBRE, bio-physical environmental featurees, important fauna and flora, management strategy and infrastructural facilities are discussed

Wolanski, E., & Sarsenski, J. (1997). Larvae dispersion in coral reefs and mangroves. *In*: Am. Sci., (85), 236-243.

Barbosa, C., Broderick, A., & Catry, P. (1998). Marine Turtles in the Orango National Park (Bijagos Archipelago, Guinea-Bissau). *In*: Marine Turtle Newsletter, (81), 6-7.
Abstract: The Orango National Park is part of the Biosphere Reserve of the Bijagos Archipelago of Guinea-Bissau, West Africa. The Park includes 5 main islands and associated islets, covering 268 km super(2), which constitute almost one third of the total land surface of

the Bijagos Archipelago. The main islands are low-lying, covered with forest and savannah, and surrounded by large areas of inter-tidal sand, mudflats, and extensive areas of mangrove. The human population is approximately 2500. Four species of turtle were recorded nesting during the surveys: green *Chelonia mydas*, olive ridley Lepidochelys olivacea, hawksbill *Eretmochelys imbricata* and leatherback *Dermochelys coriacea* turtles. We estimate that each of the first two species lay at least 200-300 nests per year on the beaches of the Park. Hawksbill and leatherback turtles seem to be very rare and only a few individualsnests were recorded during two years of surveying. However, the difficulty of distinguishing between the tracks of hawksbill and ridley turtles might have resulted in this species being under-recorded. Although this nesting population of green turtles is probably less significant than that of the neighbouring Poilao and associated islands, Orango National Park is likely to be the most important nesting ground in the Archipelago for the remaining species which are rare or absent in Poilao

Buchan, K. C. (1998). Saba, Netherlands Antilles. *In:* UNESCO CARICOMP - Caribbean coral reef, seagrass and mangrove sites. Chap. 3, (pp. 187-193). Paris: UNESCO.

Dennis, G. D., & Creswell, R. L. (1998). Within habitat variability in productivity, not all grassbeds are created equal: Implications for marine reserves. Proceedings of the Gulf and Caribbean Fisheries Institute. Merida (Mexico), Nov 1997. Vol. 50 (pp. 482-492). [s. l.]: [s. n.].
Abstract: Whether a reserve's objective is biodiversity or production the food base is a critical consideration. At this time no amount of effort by scientists can make a productive reserve from an unproductive site. While encompassing a variety of habitats in a reserve improves the prospects for productivity within a habitat, such as grassbeds or mangroves, variation in productivity may result in selection of a low production area. Sampling of grassbeds and mangroves suggest that selection of a habitat on a general basis is not adequate and productive areas (critical habitat?) must be identified and incorporated into reserve designs. The challenge for scientist is to develop methods to rapidly assess the quality of an area to decide whether to include or exclude it in a reserve plan. Recommendations are given as to what factors might be examined.

Diop, E. S. et al. (1998). Raising mangrove nurseries for reforestation of coastal areas in Senegal Somone lagoon and Saloum Islands. Technicals Reports. Dakar: [s. n.].

Diop, E. S. et al. (1998). Réhabilitation des écosystèmes dégradés de la mangrove de la Somone et des Iles du Saloum. *In:* E. S. Diop, P. S. Diouf, D. Thiam, A. Dia, M. Ly, N. A. Ndiaye, F. Ngom, & K. Sané (Coord.), Unesco-CSI (Coastal and small islands program) rapport final 1. (pp. 23-38). Dakar: Unesco-CSI.

Grasso, M. (1998). Ecological-economic model for optimal mangrove trade off between forestry and fishery production: comparing a dynamic optimization and a simulation model. *In*: Ecological Modelling, 112(2-3), 131-150.
Abstract: Mangrove ecosystems provide valuable ecological services for the maintenance of the adjacent habitats and wildlife preservation. They also provide a highly caloric timber, used frequently for burning purposes as, e. g. charcoal. The forestry activity usually ignores the capacity of the mangroves to support the local fisheries. Therefore, it is necessary to study the relationship between these activities and how they could be managed in order to maximize their benefits, and at the same time to preserve ecosystem services. This problem was approached by two different modelling procedures, widely used in natural resources management studies: a dynamic optimization and a simulation model. The dynamic optimization model gave us some hints about the best allocation of workers between forestry and fishery sectors. Using the

simulation model it was possible to take the data generated and employ it in our first order conditions equations from the optimization model to find the shadow prices for the resources stocks. The most important variable in the simulation is the forest growth rate, since the fishery production is directly dependent on the area of mangrove forest.

Horrill, J. C. (1998). A case study of collaborative management of marine protected areas in partnership with communities. *In:* Salm, R. ;Tessema, Y. Partnership for Conservation Report of the Regional Workshop on Marine Protected Areas, Tourism and Communities. Nairobi Kenya: IUCN EARO.
Abstract: Collaborative management plans were formulated by villagers and local government officers in two villages of the Tanga region, Tanzania. The area includes fringe of mangroves, coral reefs, extensive seagrass beds and sand flats. These plans recognise the need to increase reef fish stocks through conservation measures and reduction of fishing pressure on reef stocks. It should be achieved through diversification of fishing activities and reduction in the numbers of fishers. The process of management plan development started with a series of workshops where villagers and government personnel together identified critical issues, their perceived causes, and possible solutions to resolve them. At the same time, participatory socioeconomic and coral reef surveys and a study of existing traditional management systems were undertaken. The villagers formed village committees to deal with fisheries related issues. The management plans of both villages have been implemented fully for less that a year only, and the communities are still learning what their likely implementation problems are and how to resolve them.

Jaffe, R. et al. (1998). Baseline study on the levels of organic pollutants and heavy metals in bivalves from the Morrocoy National Park, Venezuela. *In*: Marine Pollution Bulletin, 36(11), 925-929.
Abstract: Bivalves have been extensively used as bioindicators of pollution in aquatic environments, particularly in coastal areas worldwide. The rationale behind the use of bivalves in monitoring programmes has been discussed in several scientific reports since the introduction of the `Mussel Watch' concept. The present study reports the concentrations of selected organic and inorganic contaminants in the flat tree-oyster (Isognomon alatus) from one of the largest marine parks in Venezuela, the Morroccoy National Park, as an initial step to determine the present levels of contaminants and establish a baseline reference for future monitoring efforts. The Morrocoy National Park (Fig. 1) covers an area of about 32000 acres, most of which comprises aquatic habitats such as mangrove forests, seagrass beds and coral reefs. The Park is composed of a series of small islands that provide a natural habitat for many endangered species of birds and constitute excellent nursery environments for numerous fish species. Its beauty has made this Park one of the primary tourist attractions in Venezuela

Jagtap, T. G. (1998). Structure of major seagrass beds from three coral reef atolls of Lakshadweep, Arabian Sea, India. *In*: Aquatic Botany, 60(4), 397-408.
Abstract: Detritus-based marine ecosystems such as mangrove and seagrass are of immense ecological importance. Major seagrass meadows from three coral atolls of the Lakshadweep group (Arabian Sea) were studied for their floral components. Seagrass beds were heterogeneous, comprising mainly of *Thalassia hemprichii* and *Cymodocea rotundata*, in Agatti and Kavaratti and it was observed to be monospecific (*T. hemprichii*) in the Kalpeni lagoon. Maximum (0. 34 km2) and minimum (0. 005 km2) extent of seagrass beds were observed in Kavaratti and Agatti lagoons, respectively. Seagrass weight (dry) of 43. 97, 30. 88 and 0. 74 t were estimated from Kavaratti, Kalpeni, and Agatti, respectively. Maximum biomass occurred from 0-2 m depth, mainly contributed by the aboveground shoots, and was found to be negatively correlated with depth (r=0. 71, preserves indicating seagrass growth

mainly by vegetative propagation. Epiphytes, on an average, contributed 7. 5% of the seagrass biomass and were dominated by algae such as Melobesia spp., *Microcoleus lyngbyaceus* and Ceramium spp. Epiphytic biomass, too, decreased with increasing depth. Associated marine algae were represented by 66 species, dominated by rhodophytes.

Kjerfve, B. et al. (1998). CARICOMP: A Caribbean network of marine laboratories, parks, and reserves for coastal monitoring and scientific collaboration. *In:* B. Kjerfve Caricomp: Caribbean Coral Reef, Seagrass and Mangrove Sites. (pp. 1-16). 7 Place de Fontenoy/75700 Paris/France: Unesco.

Mann, B., Taylor, R., & Densham, D. (1998). A synthesis of the current status of marine and estuarine protected areas along the KwaZulu-Natal coast. *In*: Lammergeyer, (45), 48-64, 35 ref. **Abstract:** Notes are given on the location, size, functions, management, evidence in support of protected area function (active protection of existing resources) and some management problems experienced within 2 marine reserves and 10 estuarine protected areas on the KwaZulu-Natal coast of South Africa. Management problems include illegal fishing, tourism pressure, destruction of swamp and mangrove forests and large-scale afforestation with Eucalyptus sp. in adjacent catchments, pollution, and altered hydrological regimes in rivers.

Muthiga, N. (1998). National perspective of marine protected areas management in Kenya. *In:* Salm, R. ;Tessema, Y. Partnership for Conservation Report of the Regional Workshop on Marine Protected Areas, Tourism and Communities. Nairobi Kenya: IUCN EARO. **Abstract**: There are four marine national parks and six marine national reserves in Kenya, which encompass a diverse selection of marine habitats including coral reefs, mangrove forests, and seagrass beds. Endangered species occur in the waters of all marine protected areas (MPAs). Some lie adjacent to the most heavily developed tourist beaches in Kenya, and the Mombasa Marine Reserve is next to the port of Mombasa, which raises concerns about the threat of pollution. Even with government subsidy, there would still be a need to develop ways to enhance the management of MPAs. Several programmes are running with the aim to develop integrated MPA managmenent plans that will incorporate a framework for collaboration among stakeholders. Finding alternative resource uses for the communities utilising marine reserves has also been initiated at the Mpunguti Marine National Reserve. The development of other alternatives, including aquaculture, reef restoration, and artificial reefs, are also being explored

Nassor, M. (1998). National perspective of marine protected area management in Zanzibar. *In:* Salm, R. ;Tessema, Y. Partnership for Conservation Report of the Regional Workshop on Marine Protected Areas, Tourism and Communities. Nairobi Kenya: IUCN EARO. **Abstract**: Zanzibar has a variety of productive and attractive marine ecosystems, such as mangroves, seagrass beds, and coral reefs that provide protection, feeding, and breeding habitats for a variety of organisms, including fishes. Four marine protected areas (MPAs) have been established so far, two of them are managed by private investors under special management agreements with the government. In 1993 it was decided that the MAPs would be managed by a section of the newly formed Commission for Natural Resources. Problems facing protected areas under management by private investors include delicate relations with other stakeholders and inadequate capacity to deal effectively with cases of destructive fishing on behalf of the enforcement authority. Problems facing protected areas under the control of the Commission for Natural Resources include disappointment by local communities with the way law enforcement institutions treat cases of destructive fishing and lack of effective mechanisms for revenue collection and expenditure to support management of protected areas.

Reina, A. (1998). Bazaruto project. A brief overview May 1998. *In:* Salm, R. ;Tessema, Y.

Partnership for Conservation Report of the Regional Workshop on Marine Protected Areas, Tourism and Communities. Nairobi Kenya: IUCN EARO.
Abstract: The Bazaruto archipelago in Mozambique is one of the country's most valuable marine areas, is rich in resources, and is among its most vulnerable and fragile ecosystems. It includes magificient coral reefs, mangroves, and seagrass beds, supports the largest remaining population of the endangered dugong, Dugong dugon, along the East African coast, and the unique marine national park in Mozambique. A project is being developed with the aim to utilise the resources of the archipelago sustainably for the long term benefit of the local communities, the region and the country through: tourism (in particular ecotourism) and artisanal forms of resources use. After several years of development, tourism enterprises are not yet in a position to make contributions to conservation and the island communities, there is still uncontrolled fishing by mainlanders especially, and semi industrial and industrial fishing. Inappropriate technologies, such as gill nets for shark fishing and over harvesting, have had an impact on the stocks of certain species of high economic value, in particular lobster and sea cucumbers, and on the survival of threatened species, such as turtles, dolphins, and dugongs. To control resource use and potential development, guarantee resource custody by the island communities, and retain income generated by the activities in the Park, it is imperative to have supportive legislation formulated and approved as soon as possible.

Villela, L. (1998). Proceedings of the workshop on sustainable conservation of marine biodiversity. (p. 166). San Jose (Costa Rica): UICN-ORMA.
Abstract: Many littoral ecosystems of the world are represented in Central Amercia, mainly mangroves, coraf reefs, coastal lagoons and large marine phanerogam meadows. The coasts are flat and sandy or with cliffs and rocks. Around 21% of the population live in the coastal areas. Central America, particularly rich from biological, cultural and esthetical points of view, with a privileged climate, is attractive to tourism development. All countries of the region have set up or are developing their main tourist activities and infrastructures in the coastal areas. With respect to sustainable development as well as to the protection of the coasts, several countries have recently created marine protected areas. Information on these areas and on their potential for tourism development is presented. The bases for a working network on tourism and protected areas are laid out.

Wang, Y., Lin, P., & Song, X. (1998). Annual dynamics of waterbirds at Futian mangrove zone, Deep Bay, Shenzhen, China. *In*: J. Xiamen Univ Nat Sci, 37(1), 122-130.
Abstract: A census of waterbirds was investigated from January to December 1994, at Neilinding-Futian Mangrove Reserve, Deep Bay, Shenzhen, China. There were 79 species belonging to 14 families, 9 orders in the record and most of the waterbirds were migrant in this area, as well as the diversity and species composition of these waterbirds were discussed. The annual dynamics of the waterbirds in the whole year was divided into four periods: winter resident period, spring migrant period, summer reproductive period and fall migrant period.

Dahdouh - Guebas, F., & Koedam, N. (1999). Recherche préliminaire de la régénération des mangroves au Parc National du Banc d'Arguin et de ses facteurs faunistiques restrictifs. (p. 41 + Bibliographie). Bruxelles: Vrije Universiteit, Faculteit Wetenschappen.

Field, C. D. (1999). Rehabilitation of Mangrove Ecosystems: An Overview. *In*: Marine Pollution Bulletin, 37(8-12), 383-392.
Abstract: The concept and goals of mangrove ecosystem rehabilitation are considered and contrasted with ideas of ecosystem restoration. Three reasons for mangrove rehabilitation: conservation and landscaping; multiple use systems for high sustainable yield and protection of coastal areas, are then examined in detail. In each case, the underlying philosophy and

limitations are presented. The practical problems of site selection for mangrove planting and techniques for regenerating mangroves are then considered. Some comments and data are then offered on mangrove ecosystem rehabilitation that is being carried out world-wide. Comment is made on the paucity of information. The practice and importance of monitoring and maintaining rehabilitated mangrove ecosystems is then presented. Finally, there is a discussion on the future management and research needs of mangrove ecosystem rehabilitation.

Ronnback, P. (1999). The ecological basis for economic value of seafood production supported by mangrove ecosystems. *In*: Ecological Economics, 29(2), 235-252.
Abstract: The undervaluation of natural products and ecological services generated by mangrove ecosystems is a major driving force behind the conversion of this system into alternative uses. This trend of undervaluation is partly due to the difficulty involved in placing a monetary value on all relevant factors, but lack of ecological knowledge and a holistic approach among those performing the evaluation may be even more important determinants. This article identifies and synthesizes ecological and biophysical links of mangroves that sustain capture fisheries and aquaculture production. Fish, crustacean and mollusc species associated with mangroves are presented and the ecology of their direct use of this system is reviewed. Through a coastal seascape perspective, biophysical interactions among mangroves, seagrass beds and coral reefs are illustrated. The life-support functions of mangrove ecosystems also set the framework for sustainable aquaculture in these environments. Estimates of the annual market value of capture fisheries supported by mangroves ranges from US$750 to 16750 per hectare, which illustrates the potential support value of mangroves. The value of mangroves in seafood production would further increase by additional research on subsistence fisheries, biophysical support to other ecosystems, and the mechanisms which sustain aquaculture production.

Yanez-Arancibia, A. et al. (1999). Integrating science and management on coastal marine protected areas in the Southern Gulf of Mexico. *In*: Ocean & Coastal Management, 42(2-4), 319-344.
Abstract: The coastal zone of the State of Campeche have some of the Gulf of Mexico's richest ecosystems characterized by extensive seagrasses, mangrove forests, low-land tidal wetlands, a broad deltaic environment, including the Usumacinta Laguna de Terminos estuarine ecosystem, and extensive low salinities and brackish wetlands in the Petenes region. Commercial and artisanal fishing, maritime transport, agriculture and cattle grazing in low-land areas, urban expansion, building of highways, and tourism, are important economics activities that are increasing in the State of Campeche. However, the growth needs to occur in a sustainable manner with adequate protection of the coastal ecosystems. The theoretical approach and conceptual basis of the integrated coastal management plan are based on 20 years of scientific research in the region; and from 1990 to the present, a number of projects have been completed which serve as case studies of coastal management coupling science, technology, public participation, and policymaking in the southern Gulf of Mexico. After developing seven "study case" integrating science into policymaking, a management approach was developed considering four main actions: promotion of institutional arrangements, so that the multi-sectorial planning approach be considered in coastal resources development; strengthening of public awareness related to coastal resources management policies and capabilities; gathering, analysis and dissemination of information related to coastal resources development; and provision of technical solutions to coastal resources uses in conflict. Finally this is a case study where science played a significant role in the politics of the policy process, both in protecting key estuarine ecosystem and the planning process defining the ICZM plans.

Barbier, E. B. (2000). Valuing the environment as input: review of applications to mangrove-fishery linkages. *In*: Ecological Economics, 35(1), 47-61.

Abstract: The following paper reviews recent developments in the methodology for valuing the role of wetlands in supporting economic activity. The main focus will be on mangroves serving as a breeding ground and nursery habitat in support of coastal and marine fisheries. As this particular ecological function of a mangrove system means that it is effectively an unpriced 'environmental' input into fisheries, then it is possible to value this contribution through applying the production function approach. The first half of the paper overviews the procedure for valuing the environment as an input, applied to the case of a wetland supporting a fishery. Both the 'static' Ellis-Fisher-Freeman approach and the 'dynamic' approach developed by Barbier and Strand, incorporating the intertemporal bioeconomic fishing problem, are reviewed. The second half of the paper discusses briefly two recent case studies of mangrove-fishery valuation. An application in South Thailand, which is based on the static Ellis-Fisher-Freeman model, and an application in Campeche, Mexico, which is based on the dynamic approach

Bay, T. (2000). Contribution à l'évaluation du stock d'huîtres de palétuviers (*Crassostrea gasar* ADANSON) dans le parc national du Delta du Saloum (Sénégal). Faculté des Sciences Agronomiques de GEMBLOUX, Belgique. Notes: Mémoire de fin d'études en vue d'obtenir le grade d'Ingénieur Agronome, orientation Elevage

Benga, A. G. F. (2000). Quantification De La Consommation En Bois De Chauffe Dans La Reserve De Biosphere Du Delta Du Saloum. Etude de cas: Le Village de Bassoul. [s. l.]: [s. n.].

Benga, A. G. F. (2000). Suivi De La Consommation Du Bois De Mangrove Comme Combustible Dans La Réserve De Biosphère Du Delta Du Saloum. Etude de cas: Le Village de Dionewar. [s. l.]: [s. n.].

Carbone, F., & Accordi, G. (2000). The Indian Ocean Coast of Somalia. *In*: Marine Pollution Bulletin, 41(1-6), 141-159.
Abstract: Somalia has the longest national coastline (3025 km) in Africa with an estimated shelf area (depth 0-200 m) of 32 500 km2. The country is divided into the northern coastal plain of Guban, which has a semi-arid terrain; the northern highlands with rugged mountain ranges containing the country's highest peak (2407 m); and the Ogaden region which descends to the south from the highlands and which consists of shallow plateau valleys, wadis and broken mountains. The latter region continues to the Mudug plain in central Somalia. From Ras Caseyr to the Kenya border, the coast runs north-east to south-west, coinciding with the displacement caused by the Mesozoic marginal subsidence. This general structure is complicated by sedimentary troughs crossing the Horn of Africa, and by large sedimentary basins, cutting the coastline and extending inland into Southern Somalia and Northern Kenya (Juba-Lamu embayment, Mogadishu basin). Offshore, the western Somali Basin extends from Socotra to the Comores. The open shelf environments developed along the Somali coast are a consequence of an extensive marine transgression, connected to coastal subsidence or inland uplift. The rocks along the southern coastal belt are Pliocene-Pleistocene, and are characterized by a sequence of both marine and continental deposits of skeletal sands, coral build-ups, eolian sands and paleosols. As well as eolian and biogenic sedimentary processes, sea-level fluctuations, Holocene climatic changes and neotectonic movements have combined to produce the modern coastline. A notable feature is an ancient dune ridge complex, known as the Merka red dune, which rims the coast extending beyond the Kenyan border and which separates the narrow coastal belt from the Uebi Shebeli alluvial plain. Two features of note are the Bajuni Archipelago, which consists of islands, islets and skerries, forming a barrier island separated from the coast by a narrow marine sound, and a braided, channelized coastal area, which

originated from the drowning of a paleofluvial net. The southern Somali coast, with that of Kenya and Tanzania, forms part of the Somali Current Large Marine Ecosystem, encompassing 700 000 km2, and extending 800 km between Dar es Salaam and Ras Hafun. Abundant biomass develops here due to upwelling. The shelf area has a wide variety of coral reefs, mangroves, seagrass meadows, beaches and estuaries. In shallow water areas the abraded flats are colonized by scattered coral communities with variable cover. A true fringing reef is achieved in places only in the Bajuni archipelago. All along the southern Somali coastal shelf there are spreading meadows of Thalassodendron seagrass, and benthic communities typical of mobile sandy substrates are limited to beach ridges and shoals developed along the coastline. Around the Bajuni barrier island and the channelized area there is more diversity. Mangroves grow on the tidal belts of the channels, and there are expanses of salt flats. Large-scale alteration produced by man on the Somali coast is relatively recent, but has accelerated in the last few decades, especially around major cities. This alteration affects especially backshore areas where the Pleistocene coral reefs are quarried. At present, the continental shelf is not adequately monitored or protected, so coastal habitats are being degraded, living marine resources are overexploited, and pollution levels are increasing, all of which affect natural resources and biodiversity. Somalia is one of the world's poorest and least developed countries, with few resources and devastated by civil war, but since 1993 it has been part of the Common Market for Eastern and Southern Africa (COMESA). This will affect fisheries and aquaculture in terms of the investment, production, trade and fish consumption of the member states. There are currently no marine protected areas and no legislation concerning their establishment and management, although the World Conservation Monitoring Centre (WCMC) Protected Areas Database lists Busc Busc Game Reserve as an MPA. In 1992, The WCMC also listed the following coastal sites as proposed protected areas: Zeila (important sea bird colonies on offshore islets), Jowhar-Warshek, Awdhegle-Gandershe. The area from Kisimayo to Ras Chiambone is probably of highest priority, as it is important for coral reefs, marine turtles, and mangrove resources, although it is still poorly known.

Gladstone, W. (2000). The ecological and social basis for management of a Red Sea marine-protected area. *In*: Ocean & Coastal Management, 43(12), 1015-1032.
Abstract: The Farasan Islands in the southern Red Sea of Saudi Arabia have nationally and internationally significant conservation values, and are important for a range of marine-based resource uses. In preparation for the establishment of a marine protected area around the Farasan Islands and its management, surveys were undertaken to assess the state of the coastal and marine resources, and the issues associated with human activities. Stakeholders were interviewed about issues and their attitudes towards the proposed protected area, and constraints to planning and management were identified. Marine habitats included seagrass beds, mangroves, and extensive areas of fringing reef dominated by a diverse coral community or a mixture of coral and macroalgae. Although used for a diverse range of human activities (fishing, shipping, transport, military purposes, recreation, waste dumping, sand extraction) impacts were minimal and localized. The most immediate threat to the marine resources was over-exploitation by fisheries. The types of management activities appropriate to the MPA, and the scale of management, were constrained by a number of unique and important factors: declines in national financial support for conservation efforts, a lack of trained personnel, difficulties in attracting staff to this remote location, loss of community support, the absence of a tourist base from which economic instruments could be developed, and the lack of local non-governmental organizations. Management recommended for the Farasan Islands Marine-Protected Area included zoning, community participation in management, public awareness, and training as a first step, followed by site-specific management actions, research and monitoring, and infrastructure development.

Konen, A. (2000). De la Représentation au Reboisement: dynamiques sociales et mangrove chez les sereer au Sénégal. Université libre de Bruxelles, [s. l.]. Notes: Mémoire: sciences sociales

L'hoir, V. (2000). Etude de la filière de perches de palétuviers dans le delta du Saloum (Sénégal). Faculté des sciences agronomiques de Gembloux, Belgique. Notes: Mémoire de fin d'études en vue de l'obtention du diplôme d'ingénieur agronome

Leruse, G. (2000). Estimation de la consommation de bois de mangrove par les populations de la réserve de la biosphère du delta du Saloum (Sénégal) et propositions de méthodes de gestion. ENCR, Bambey. Notes: Mémoire de fin d'études en vue de l'obtention du grade d'ingénieur agronome. (eaux et forêts)

Ngom, F. (2000). Relations bio-écologiques entre les peuplements de poissons et la mangrove de l'estuaire du Sine Saloum. Université de Dakar, Dakar. Notes: Mémoire de DEA de biologie animale

Nurse, M., & Kabamba, J. (2000). Defining institutions for collaborative mangrove management : a case study from Tanga, Tanzania. (p. 16). Nairobi: EARO.

Price, A. et al. (2000). Environmental and bioeconomic characterisation of coastal and marine systems of Cameroon, including risk implications of the Chad-Cameroon pipeline project. *In*: Aquatic Ecosystem Health and Management, 3(1), 137-161.
Abstract: We assess the status of Cameroon's coastal and marine environment, from field survey results and analysis of existing environmental and bioeconomic datasets. The study was undertaken at a broad level, and at greater resolution in the area likely to be influenced by the Chad-Cameroon pipeline. Thirty-six coastal sites are characterised using a proven, robust environmental assessment technique. Solid waste was more prevalent and abundant than beach oil, and both were most common around Douala towards Kribi. Offshore sampling was undertaken at 77 sites, 80% of which were dominated by mud or silt fractions, whereas hard substrata were uncommon. Key biological resources were identified in three main areas of the Cameroon coast, from the analysis of existing environmental data, using a Geographic Information System: (1) northern region around Ndian (mangroves); (2) central region in and around Douala (mainly mangroves and including a protected area); and (3) southern region between Kribi and Campo (mangroves including a protected area). Coastal usespressures are greatest around Douala, an area associated with at least five different major usespressures. Other parts of the coast appear to have fewer usespressures, although these areas are extensive. Coastal areas where concentrated biological resources coincide with coastal usespressures are extensive, encompassing much of the coastal zone. These are indicative of resource-use conflicts, where management action should be a high priority. Areas where biological resources coincide with multipleheavy coastal uses and pressures are fewer and less extensive. Cameroon's coastal resources (e. g. fisheries) are of direct significance. Their ecosystem services are also important, an estimated US$ 8. 3 billion y-1 nationally. This is equivalent to US$ 600 person-1 y-1, a figure approximating per capita gross national product (US$ 610). Within the pipeline project area, ecosystem services may be ca. US$ 1. 5 billion y-1, or US$ 105 person-1 y-1. Estimated project benefits from royalties are equivalent to only US$ 4 person-1 y-1 over 30 years and about 1700 jobs. Major project costs are ca. US$ 1. 8 billion. Valuations of both ecosystems and the project necessarily make assumptions. Nevertheless, even large reductions in individual habitat values do not undermine the remarkable overall value of ecosystem service and natural capital, nor their importance in cost-benefit analysis. Our assessment of overall risk of coastal oil

pollution in the project area combines probability of spillage (based on previous work), and a modified index of environmental sensitivity. This estimates the extent of coastline and habitats at risk, and the associated degree of overall risk. High risk areas include: (1) area between Enyangoe and Ondja (northcentral project area); (2) area from Loiaba to south of Biyo (southcentral project area); and (3) segment of coast to the north and south of Campo (south project area). The same process can be applied using different oil spill scenarios or more comprehensive datasets.

Primavera, J. H. (2000). Development and conservation of Philippine mangroves: institutional issues. *In*: Ecological Economics, 35(1), 91-106.
Abstract: The decline of Philippine mangroves from half a million hectares in 1918 to only 120000 ha in 1994 may be traced to local exploitation for fuelwood and conversion to agriculture, salt beds, industry and settlements. But brackishwater pond culture, whose history is intertwined with that of mangroves, remains the major cause of loss. The paper discusses the institutional issues -- aquaculture as development strategy, low economic rent of mangroves, overlapping bureaucracy and conflicting policies, corruption, weak law enforcement and lack of political will -- relevant to this decline. Recommended policies are based on these institutional factors and the experiences in mangrove rehabilitation including community-based efforts and government programs such as the 1984 Central Visayas Regional Project. These recommendations include conservation of remaining mangroves, rehabilitation of degraded sites including abandoned ponds, mangrove-friendly aquaculture, community-based and integrated coastal area management, and provision of tenurial instruments.

Qoidbach, C. (2000). L'homme Et L'écosystème Mangrove: Exploitation d'une ressource et son cadre symbolique. Université libre de Bruxelles, [s. l.]. Notes: Mémoire de fin d'étude

Schaeffer-Novelli, Y. et al. (2000). Brazilian mangroves. *In*: Aquatic Ecosystem Health and Management, 3(4), 561-570.
Abstract: Of Brazil's 7408 km of coastline 6786 km contain mangrove forests, covering some 25,000 km2. Only one coastal state, Rio Grande do Sul, lacks mangrove coverage. Mangroves occur from the border with French Guiana, just above the Equator (04[deg]30'N) to well beyond the Tropic of Capricorn, reaching 28[deg]30'S, near Laguna (Santa Catarina State). Because the term mangrove may be applied to various levels of observation, specifying the proper spacio-temporal scale is important to describe system behavior. In this paper we describe a nested hierarchy of organization levels constituted of patches, stands, settings, coastal segments and large marine ecosystems. Each of these describes an organization that has evolved to facilitate energy dissipation at its relevant scale, and can be related to a geographic unit. We expect that the framework presented here will be useful for the study of mangrove ecosystem health, assessment of ecosystem pathology, and the development of models for the management and conservation of this resource.

Stejskal, I. V. (2000). Obtaining Approvals for Oil and Gas Projects in Shallow Water Marine Areas in Western Australia using an Environmental Risk Assessment Framework. *In*: Spill Science & Technology Bulletin, 6(1), 69-76.
Abstract: The oil and gas industry is of major economic importance to the state of Western Australia. The majority of its activities are offshore, some occurring in shallow marine areas adjacent to sensitive resources such as coral reefs and mangroves. One of the main issues for the oil and gas industry is continued access to marine acreage. Increasing public concern about the environmental protection of the coastal and marine environment has increased the focus on the various users. This has resulted in the development of statutory and administrative processes, more stringent environmental assessment and operating conditions, and greater

scrutiny on the issue of access of proposals to some areas. Detailed environmental assessment and management plans are generated for all drilling and development projects. An environmental risk assessment approach utilising computer modelling, habitat mapping, research and monitoring is used to evaluate the risk of a project on adjacent resources and to obtain government approval. The Wonnich appraisal drilling program, which consisted of two wells drilled from the same surface location situated one kilometre away from an area of high conservation value, will be used as a case study of the risk assessment procedure used by one oil and gas company.

Thiam, N. (2000). Etude et inventaire des stocks d'huîtres de palétuviers, *Crassostrea gasar* Adanson (1891) dans la réserve de biosphère du delta du saloum- Sénégal: Comparaison des sites de Bakadadji et de Dionewar. UCAD, Dakar. Notes: DEA de biologie animale

Vidy, G. (2000). Mangrove et estuaire et le concept de nursery : qui est qui ? Le cas du Sine Saloum (Sénégal). *In*: Wetlands Ecology and Management, 8, 37-51.
Abstract: Une caractéristique de la zone de mangrove du Sine Saloum au Sénégal est l'absence de cours d'eau permanent. Cette situation est aggravée par la sécheresse qui sévit depuis les années 1970. La conséquence au plan écologique et que le Sine Saloum a évolué en un estuaire inverse dans lequel la salinité augmente vers l'amont jusqu'a atteindre des valeurs de 100 ‰ et plus pour des moyennes variant entre 45 et 50 ‰. Un programme de suivi du peuplement de juvéniles de poissons a été mené pendant trois années dans le but de vérifier si, dans les conditions actuelles, le système joue encore un rôle effectif de nursery à l'égard des espèces exploitées. L'engin principal utilisé pour l'échantillonnage était la nasse complétée par des filets maillants ainsi qu'un échantillonnage limité à l'aide de la roténone. L'une des six stations que comportait le programme d'échantillonnage présente une diversité spécifique nettement supérieure. Cette station est la seule pour laquelle des niveaux de salinité relativement bas, jusqu' 25‰, sont notés en fin de saison des pluies bien que les zones amont proches de la station présentent des salinités plus élevées. Une hypothèse pour expliquer ces salinités basses serait l'existence d'un affleurement de la nappe phréatique ou de sources marines. Une telle observation permet de mettre en évidence les rôles respectifs des estuaires et des mangroves dans la fonction de nursery.

Yap, H. T. (2000). The case for restoration of tropical coastal ecosystems. *In*: Ocean & Coastal Management, 43(8-9), 841-851.
Abstract: At no time have humans so altered their natural environment than the present. Marine ecosystems have not been spared, and the degradation of coastal habitats has reached severe proportions in many parts of the world. The mere setting aside of areas for protection may not be enough to ensure adequate production and provision of services for a growing global human population. Hence, the active restoration of habitats, in addition to protection and preservation, is probably the more desirable conservation strategy. Accumulated experience over several decades has demonstrated that the rehabilitation or even restoration of damaged coastal ecosystems is feasible. However, the degree of difficulty and expense involved vary, with coral reefs being the most complicated habitats to restore, followed by seagrass beds and then mangrove forests. In ecosystem restoration, a comprehensive strategy based on sound biological and ecological principles, and proven techniques must be developed. A concrete, achievable goal must be articulated. Because of the dynamic nature of ecosystems, and the inability to accurately predict pathways of succession after a community is established through artificial means, subsequent modifications to a project must proceed within a flexible framework of adaptive management. Finally, for restoration efforts to be successful, local communities must participate actively in cooperation with local governments in accordance with the principle of co-management.

Hossain, M. S. (2001). Biological aspects of the coastal and marine environment of Bangladesh. *In*: Ocean & Coastal Management, 44(3-4), 261-282.
Abstract: Bangladesh, which has a warm tropical climate and abundant annual rainfall, has very rich coastal waters; these support diverse and abundant marine life. The coastal and marine environment is becoming increasingly important in fulfilling social, economic, development and strategic objectives of the country. The biological character is briefly reviewed to provide a background to the main habitats and their condition. The marine resources are described, while emphasis is given to living resources, particularly ecosystems and fisheries. Of the inter-tidal ecosystems, mangroves are the most diverse and highly productive and very important regionally. Considering the major regional and global context, fisheries and aquaculture are important, particularly for penaeid shrimp (*Penaeus monodon*) and also for pomfret, hilsa shed, bombay duck, mackerel, eel, ribbon fish, snapper, cat fish and Indian salmon. Oil, domestic, urban and industrial pollutants are a problem in several parts of the coastal zone, although effects on ecosystem structure and function are generally not well known. The coastal zone is also fast becoming the depository for solid wastes. The orientation towards coastal management action requires clear guidance, a well-organized government structure, and -- most importantly -- a well defined set of objectives and actions.

JAFTA. IC Net limited, & Association japonaise de technologie forestière. (2001). Etude pour une gestion durable de la mangrove de la petite cote et du delta du saloum de la république du sénégal. (p. 59). Dakar: Direction des eaux et forêts chasses et de la conservation des sols. Ministère de la jeunesse, de l'environnement et de l'hygiène publique.

Obura, D. O. (2001). Kenya. *In*: Marine Pollution Bulletin, 42(12), 1264-1278, many ref.
Abstract: The Kenya coast is bathed by the northward-flowing warm waters of the East Africa Coastal Current, located between latitudes 1 and 5? S. With a narrow continental shelf, the coastal marine environments are dominated by coral reefs, seagrass beds and mangroves, with large expanses of sandy substrates where river inputs from Kenya's two largest rivers, the Tana and Athi rivers, prevent the growth of coral reefs. The marine environment is characterized by warm tropical conditions varying at the surface between 25 and 31?C during the year, stable salinity regimes, and moderately high nutrient levels from terrestrial runoff and groundwater. The semi-diurnal tidal regime varies from 1. 5 to 4 m amplitude from neap to spring tides, creating extensive intertidal platform and rocky-shore communities exposed twice-daily during low tides. Kenya's marine environment faces a number of threats from the growing coastal human population estimated at just under three million in 2000. Extraction of fish and other resources from the narrow continental shelf, coral reef and mangrove ecosystems increases each year with inadequate monitoring and management structures to protect the resource bases. Coastal development in urban and tourist centres proceeds with little regard for environmental and social impacts. With a faltering economy, industrial development in Mombasa proceeds with few checks on pollution and other impacts. In 1998 Kenya's coral reefs suffered 50-80% mortality from the El Nino-related coral bleaching event that affected the entire Indian Ocean. The institutional, human resource and legal infrastructure for managing the coastal environment has in the past been low, however these are rapidly improving with the revitalization of national institutions and the passing in 1999 of an Environment Act. Marine Protected Areas are the key tool currently used in management of marine ecosystems, and focus principally on coral reefs and biodiversity protection. New initiatives are underway to improve application of fisheries regulations, and to use Integrated Coastal Area Management as a framework for protecting marine and coastal environments.

Sheppard, C. (2001). The Main Issues Affecting Coasts of the Indian and Western Pacific Oceans: A Meta-analysis from Seas at the Millennium. *In*: Marine Pollution Bulletin, 42(12),

1199-1207.
Abstract: A review of the world oceans in three volumes by 365 scientists, provides scope for several `meta-analyses' of the main problems affecting over 100 areas in the year 2000. This article summarises the main issues affecting a sub-set of the reviewed areas, covering Asian, African and Arabian countries dealt with in Volume 2, which included over 50 articles. From all issues raised, assessment is made of the nature of the major ones, including evaluation of reasons why so many of them remain important issues after so much attention to them. These include long standing problems, several problems more newly flagged as becoming particularly important, the issue of global warming and no less than three related issues connected with fishing and over exploitation. One or two issues such as industrial pollution and sewage, previously considered of almost universal concern, almost traditional pollution issues even, continue to feature strongly for some countries, but while these were almost always referred to in Seas chapters, by and large these categories appear not to be the most pressing of issues today, except in localized areas (albeit areas where huge numbers of people live). Perhaps other issues have simply taken over. They are excluded from this article.

Diadhiou, H. D., Dème, M., & Thiam, D. (2002). Déforestation de la Mangrove et Durabilité de l'Exploitation des Ressources Malacologiques dans l'Ecosystème Estuarien du Delta du Fleuve Saloum. Dakar: Projet Valeurs, UICN.

Faye, M. N. (2002). Etude Phenologique Du Genre Rhizophora Et Influences Des Facteurs Edaphologiques (PH et salinité) sur la végétation de la mangrove de l'estuaire du Saloum, Sénégal. (43 p. + Annexes). [s. l.]: [s. n.].

Cambers, G. ([s. d.]). Planning for coastal erosion / eastern Caribbean islands. (also in French and Spanish). *In:* Environment and development in coastal regions and in small islands. APPENDIX III. Forum Contributions up to 30th September 2000.

UNEP, Ramsar, & FAO. ([s. d.]) The Mangroves an undervalued biotope. [Web Page]. URL http://www. afrol. com/Categories/Environment/backgr_mangroves. htm.

WWF. ([s. d.]) Marine protected areas. [Web Page]. URL http://www. panda. org/resources/publications/water/mpa/introduction. html.
Abstract: Introduction. The idea of restricting human activity in the marine environment has flourished for centuries in some parts of the world. Areas closed seasonally or permanently to fishing have been set up and managed by local communities to help maintain fishery resources. During this century, marine protected areas (MPAs), variously called marine parks, reserves, or sanctuaries, have been created to: help protect vulnerable habitats and threatened species increase fishery productivity by protecting critical breeding, nursery, and feeding habitats such as estuaries, mangroves, seagrass beds, and coral reefs protect breeding populations which can help restock and restore overexploited areas reduce the impact of tourism and other direct human activities provide local communities with alternative livelihoods such as well-managed tourism.