



Project CONSDEV, n°ICA 4-2001-10043

(INCO-DEV Programme, European Commission, Research Directorate-General)

**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 políticas de conservação e de desenvolvimento das áreas  
protegidas marinhas e costeiras na Africa Ocidental**

**BIBLIOGRAPHY ON MARINE PROTECTED AREAS**

General and West African references

By : **Cheikh Ndiaye, Claire Bassène, Jean-Yves Weigel (IRD)**

**IRD – Dakar**

Dakar, July 2002

Ref : CONSDEV Working Document /WP1/03

## 16. HISTORICAL ACCOUNT

**Astrié, M.** (1886). Voyage dans l'île d'Orango (Guinée portugaise). *In: Boletim Da Sociedad De Geografia De Lisboa*, 6(1), 38-55.

**Widal, G.** (1922). L'Île d'Arguin. *In: Bulletin Du Comité D'Etudes Historiques Et Scientifiques De L'AOF*, (1), 114-127.

**Delibrias, G.** (1975). New data for the Atlantic Sahara (Holocène) tentative interpretations. (pp. 534-546). Meudon - Bellevue: Laboratoire de Géologie du Quaternaire; CNRS.

**Gallois-Duquette, D.** (1976). Informations sur les arts plastiques des Bidyogo. *In: Arts D'Afrique Noire*, 18, 26-43.

**Woodbury, R. O., & Little, E. L. Jr.** (1976). Flora of Buck Island Reef National Monument (U.S. Virgin Islands). Vol. 4 pl.; 17 ref. (p. 27 pp.). Puerto Rico: Institute of Tropical Forestry. **Abstract:** An annotated systematic list of 228 species, including 62 trees, found on this small uninhabited island (only 1 mile long) off St. Croix, with a history of the island. The vegetation is tropical dry deciduous forest considerably modified by former settlement and logging. [The island is primarily a marine reserve.]

**Levivier, J.** (1977). Les Marais d'Annoville du parc médiéval au centre d'initiation à l'environnement. *In: Courrier De La Nature*, (47), 32-38.

**Abstract:** The lower part of Annoville is described. Three main zones are distinguished: (a) a double line of dunes; (b) a zone of more or less marshy and submerged meadows; (c) a zone of permanent and marshy meadows. An outline of the flora of the Annoville community is presented. It is rich and varied and may be divided into that of (a) the littoral dunes; (b) the marshy hinterland; (c) the grove; (d) the prelittoral zone exposed at low tide. Data on the fauna, especially the birds and mammals, are also given. The question of whether the classified site of the 'Communal marshes of Annoville' was formerly part of a medieval park is raised in a historical account of the area. The interest of the site as a permanent centre for education in environmental matters is discussed. It would allow the study of various habitats: continental, estuarine, intertidal and marine

**Linky, E.** (1977). Marine sanctuaries and federal apathy. *In: Underwater Naturalist*, 10(2), 4-7.

**Abstract:** The author describes the problem of ocean waste disposal, citing the New York Bight as an example of the effect of sludge dumping and other environmental abuses. Efforts are underway to eliminate ocean waste disposal by 1981. the structure and history of the Ocean Dumping Law is explained and the administration of the marine sanctuaries program by the National Oceanic and Atmospheric Administration is examined. Marine sanctuaries are those areas of ocean waters designated for the purpose of preserving and restoring, for conservation, recreation, ecologic or aesthetic values. The author accuses the federal government of the present administration (of both ocean dumping and marine sanctuary programs) of disregarding the public interest, and allowing water quality to decline as a consequence.

**Vermeij, G. J.** (1977). The Mesozoic marine revolution: Evidence from snails, predators and grazers. *In: Paleobiology*, 3(3), 245-258.

**Abstract:** Tertiary and Recent marine gastropods include in their ranks a complement of mechanically sturdy forms unknown in earlier epochs. Open coiling, planispiral coiling, and umbilici detract from shell sturdiness, and were commoner among Paleozoic and Early

Mesozoic gastropods than among younger forms. Strong external sculpture, narrow elongate apertures, and apertural dentition promote resistance to crushing predation and are primarily associated with post-Jurassic mesogastropods, neogastropods, and neritaceans. The ability to remodel the interior of the shell, developed primarily in gastropods with a non-nacreous shell structure, has contributed greatly to the acquisition of these antipredatory features. The substantial increase of snail-shell sturdiness beginning in the Early Cretaceous has accompanied, and was perhaps in response to, the evolution of powerful, relatively small, shell-destroying predators such as teleosts, stomatopods, and decapod crustaceans. A simultaneous intensification of grazing, also involving skeletal destruction, brought with it other fundamental changes in benthic community structure in the Late Mesozoic, including a trend toward infaunalization and the disappearance or environmental restriction of sessile animals which cannot reattach once they are dislodged. The rise and diversification of angiosperms and the animals dependent on them for food coincides with these and other Mesozoic events in the marine benthos and plankton. The new predators and prey which evolved in conjunction with the Mesozoic reorganization persisted through episodes of extinction and biological crisis. Possibly, continental breakup and the wide extent of climatic belts during the Late Mesozoic contributed to the conditions favorable to the evolution of skeleton-destroying consumers. This tendency may have been exaggerated by an increase in shelled food supply resulting from the occupation of new adaptive zones by infaunal bivalves and by shell-inhabiting hermit crabs. Marine communities have not remained in equilibrium over their entire geological history. Biotic revolutions made certain modes of life obsolete and resulted in other adaptive zones becoming newly occupied

**Barnes, N. E., & Piper, D. J. W.** (1978). Late Quaternary geological history of Mahone Bay, Nova Scotia. *In: Canadian Journal of Earth Sciences*, 15(4), 586-593.

**Abstract:** Mahone Bay is located on the Atlantic coast of Nova Scotia. It is an exhumed Carboniferous basin, overdeepened by glacial erosion, with widespread late Wisconsinan sheet and drumlin tills. Subglacial channels that cut both till and bedrock were formed when the ice sheet stagnated after marine incursion into the Bay of Fundy. Seismic reflection profiling and piston cores show up to 75 m of proglacial lake silts ponded behind a bedrock still at the entrance to the bay. These are overlain by a thin lagoonal sequence, and then by marine sediments accumulated over the last 6000 years, reflecting the gradual Holocene transgression

**Chase, A. K.** (1978). Between land and sea: aboriginal coastal groups in Cape York Peninsula. *In: Workshop on the northern sector of the Great Barrier Reef. Papers and proceedings of a workshop held in Townsville, Australia 20 and 21 April, 1978. Great-Barrier-Reef-Marine-Park-Authority Workshop-Series GBRMPA: Vol. 1.*

**Abstract:** The paper presents an outline of man-environment interaction for Aboriginal people who traditionally inhabited the eastern coastline of Cape York Peninsular. The relevance of Aboriginal culture to the proposed marine park is discussed. Both the material evidence i.e. the archeological remains and the mythological sites of past Aboriginal history need protection.

**Melo-Silva, D. d.** (1978). Relatorio sobre o grupo etnica Bijago da Guine-Portuguesa. (p. 97). Bissau: SIDA.

**Ray, G. C., Dobbin, J. A., & Salm, R.** (1978). Strategies for protecting marine mammal habitats. *In: Oceanus*, 21(2), 55-67.

**Abstract:** The protection of marine mammal species requires identification of areas of special biological significance, or 'critical habitats'. Recent legislation and research work have emphasised the value of a habitat approach to management, which the authors have attempted to illustrate by means of a management model, based on walrus (*Odobenus rosmarus*)

*divergens*) populations in the Bering Sea. The model integrates data on: (1) the hydrography of the study area; (2) the distribution, life history, food habits and community structure of the walrus; (3) existing and proposed socioeconomic activities; (4) legal and jurisdictional matters. Areas of high vulnerability are identified by mapping the mating grounds, pupping grounds, migration routes and food supply, and then overlaying additional data in a colour-coded system. This gives a visual presentation of potential conflicts and responsibility for action, which may be used as a strategic planning tool for protection measures such as the establishment for sanctuaries. The article concludes with a discussion of the usefulness of this and other approaches to management problems

**Saunders, G. W.** (1978). National Parks in the area and adjacent areas. Workshop on the northern sector of the Great Barrier Reef. Papers and proceedings of a workshop held in Townsville, Australia 20 and 21 April, 1978. Great Barrier Reef Marine Park Authority *Workshop Series GBRMPA*: Vol. 1.

**Abstract:** The region adjacent to the Great Barrier Reef contains widespread and diverse natural areas which on present world standards must be regarded as almost pristine. The history, flora and fauna of existing and proposed national parks and their significance for nature conservation purposes are set out. Management of these areas cannot be divorced from management of the surrounding waters, reefs and submerged lands.

**Warner, T. D., & Holecek, D. F.** (1978). Underwater parks: an unexplored frontier ? *In: Parks and Recreation*, 13(11), 18-20, 36.

**Abstract:** Existing underwater parks fall into two categories: (1) sites containing significant or unique animal and plant communities, or (2) sites containing historical artifacts. The term underwater park also connotes the establishment of "offshore" boundaries and "onshore" facilities such as a dive or interpretive centre. The parks would be developed and managed just as land based recreation is. The potential of the Great Lakes is explored. Michigan has spent much time investigating the possibilities and is concerned at the number of shipwrecks which are being removed or destroyed by clumsy salvage methods. Although a virtually untapped leisure-time resource is available, it is the protection of these scientifically and historically valuable shipwrecks which is seen as most important.

**Adams, P. B.** (1979). Life history patterns in marine fishes and their consequences for fisheries management. *In: Fishery Bulletin*, (78), 1-12.

**Cooper, A. K. et al.** (1979). Hydrocarbon potential of Aleutian basin, Bering Sea . *In: Am. Assoc. Pet. Geol. Bull.*, 63(1), 2070-2087.

**Abstract:** The basin is underlain by a flat-lying sequence of mostly Cenozoic sediment 2 to 9 km thick that rests on an igneous oceanic crustal section. Prior to 1974, marine investigations in the Aleutian basin were directed at understanding the basin's regional geologic and geophysical framework; more recent investigations by the U.S. Geological Survey have been aimed at assessing the basin's hydrocarbon potential. Preliminary results suggest that the four major requirements for hydrocarbon accumulations may be present - structural and stratigraphic traps, source rocks, reservoir beds, and an adequate thermal and sedimentation history. The recent energy-resource studies indicate that: (1) numerous structural features (gentle folds, diapirs, basement ridges) are present in the central and eastern parts of the basin; (2) acoustic features called VAMPs (velocity amplitude features) are common (over 350 identified) in the central basin; these features may be caused by pockets of gases and possibly other hydrocarbons that have been trapped in the sedimentary section; (3) the sedimentary section consists of diatomaceous sediment overlying indurated mudstones; high porosities (58 to 85%) and good permeabilities (10 to 35 md) in the diatomaceous sediment suggest that it is a potential

reservoir unit and the thick section of underlying mudstone may contain the source beds; (4) concentrations of organic gases, primarily methane, in the upper 1 to 3 m beneath the seafloor are very small, increase with depth, and are highest in areas near VAMPs; (5) the thermal gradient and the sediment thickness are sufficiently large to allow hydrocarbon maturation at depth

**Descamps, C., & Thilmans, G.** (1979). Les tumulus coquilliers des îles du Saloum (Sénégal). Chap. 5455, (pp. 81-91). Dakar, Sénégal: Ass. Sénégal Et. Quatem. Afr. Bull. Liaison.

**Field, M. E. et al.** (1979). Upper Quaternary peat deposits on the Atlantic inner shelf of the United States. *In: Bull. Geol. Soc. Am.*, 90(7), 618-628.

**Abstract:** Twenty-one upper Quaternary peat samples have been obtained from vibracores collected along the inner continental shelf of the Atlantic coast of the United States. Radiocarbon ages and pollen identifications from the peats, coupled with those from onshore borings and published data, provide additional information on the latest history of the Atlantic shelf. The radiocarbon ages cluster in two groups: early and middle Holocene time (10,000 to 5,000 B.P.) and late Pleistocene time (35,000 to 20,000 B.P.). Although ages and depths of the upper Pleistocene peats show some agreement with published graphs of changes in sea level, pollen data indicate that most of the peats formed in terrestrial environments and therefore may be unreliable as indicators of sea level. The Holocene peats were deposited in both marine and terrestrial environments. Correlation of the stratigraphic sequences in the cores containing peat with high-resolution seismic reflection profiles indicates a history of transgressive erosion on the inner shelf. Only remnants of carbonaceous sediments originally deposited in bogs, ponds, estuaries, and salt-marsh lagoons are present in the shallow subsurface on the inner shelf. These remnants, which are discontinuous and usually associated with erosional unconformities, provide evidence of regional marine inundation of the shelf by the rising Holocene sea

**Martin, V., & Becker, C.** (1979). Documents pour servir à l'histoire des îles du Saloum. *In: Bulletin De L'Ifan, Série B, t. XLI(4), 722-772.*

**Dutro, J. T. Jr.** (1980). Identified Fossils From the Flaxman Formation. *In: Environmental Assessment Of The Alaskan Continental Shelf. Annual Reports Of Principal Investigators For The Year Ending March 1980. Volume 4: Hazards. Boulder: Office of Marine Pollution Assessment.*

**Abstract:** The area of origin of erratic boulders in the Flaxman Formation remains uncertain. The fossils contained in the occasionally fossiliferous carbonate boulders of the Flaxman Formation may eventually aid in recognition of the Flaxman Formation source area. For that reason, two identification reports on early Paleozoic fossils collected in Flaxman Boulders near Brownlow Point are given

**Frazier, J.** (1980). Exploitation of marine turtles in the Indian Ocean. *In: Hum. Ecol.*, 8(4), 329-370.

**Abstract:** An understanding of exploitation is imperative to guarantee future populations, yet available information is sketchy. 'Subsistence hunting' is an ambiguous term, since the most intense exploitation is for export. Historically this has involved *Chelonia*- and *Eretmochelys*-, whose populations are now much reduced. Yet, newly 'discovered' populations (*Lepidochelys*- especially) are being exploited, under the stimulus of new foreign markets (e.g., leather), and their fates seem even less hopeful than those of long-exploited populations. 'Subsistence hunting' for immediate local consumption has led to depletion of nesting and feeding populations of turtles in areas where protein sources are in great demand and human population densities high. Ecological arguments alone are insufficient to manage these resources,

economic considerations must be considered.

**Hopkins, D. M., & Hartz, R. W.** (1980). Coastal Morphology, Coastal Erosion, and Barrier Islands of the Beaufort Sea Coast. *In: Environmental Assessment Of The Alaskan Continental Shelf. Annual Reports Of Principal Investigators For The Year Ending March 1980. Volume 4: Hazards.* Boulder: Office of Marine Pollution Assessment.

**Abstract:** To assess the potential impact of petroleum exploration and development within the coastal zone of the Beaufort Sea it is necessary to define the relationship of coastal geologic and geomorphic processes to shoreline history and the occurrence of subsea permafrost. In spite of the short ice-free period and relatively low wave energy environment, the coast of the Beaufort Sea is retreating at a spectacular rate. This rapid rate of coastal erosion is mainly the result of two distinctly arctic processes; thermokarst collapse and thermal erosion. The discontinuous chains of offshore islands extending from Point Barrow to Brownlow Point greatly affect water circulation and sediment transport on the inner shelf of the Beaufort Sea. Long-term comparisons seem to indicate that the islands are migrating with little loss of area and mass. Because many of the islands in the Beaufort Sea island chains are mostly lag deposits derived from sand and gravel sources that have now disappeared, they must be regarded as irreplaceable. If they are quarried and removed, they would not be replaced by natural processes, and the local oceanographic and biologic regime would be irreversibly altered

**Hopkins, D. M., Robinson, S. W., & Buckley, J.** (1980). Radiocarbon Dates From the Beaufort and Chukchi Sea Coasts (1979-1980). *In: Environmental Assessment Of The Alaskan Continental Shelf. Annual Reports Of Principal Investigators For The Year Ending March 1980. Volume 4: Hazards.* Boulder: Office of Marine Pollution Assessment.

**Abstract:** The results of radiocarbon dating of 24 samples from coastal areas of the Chukchi and Beaufort Seas and continental shelf of the Beaufort Sea are reported. The report supplements and in a few cases amends information given in a previous list of 22 dates. Locality data, stratigraphic notes, and some discussion are given and localities are shown on figures. Additional discussion is given for some of the conclusions that can be drawn from the two date lists. The confirmation that wood in alluvium and thaw-lake deposits may be centuries of even millenia older than the enclosing sediments should be kept in mind in detailed studies of palynological sequences and alluvial history in Arctic Alaska

**Hunter, R. E.** (1980). Depositional environments of some Pleistocene coastal terrace deposits, southwestern Oregon - case history of a progradational beach and dune sequence. *In: Sedimentary Geology, 27(4), 241-262.*

**Abstract:** Pleistocene coastal terrace deposits exposed in sea cliffs near Gold Beach, Oregon, can be divided into four stratigraphic units: a basal gravelly unit and three overlying sandy units, each with mud beds, a paleosol, or the modern soil in its uppermost part. The gravelly unit consists of gravel and sand in its lower part, sand, in part pebbly or cobbly, in its middle part, and mud and sand in its upper part. Black sand and transported pieces of wood are common in the middle part of the unit, and wood is common in the mud. This unit is interpreted as a progradational deposit including environments ranging from lower forebeach at the base to backbeach flats and streams at the top. The main sandy parts of the sandy units are made up of a crossbedded sand facies, the dominant structure in which is medium-scale crossbedding, and an irregularly bedded sand facies, which is locally pebbly and is dominated by scour-and-fill structures. Deciding between shallow marine and eolian interpretations of the sandy units proved exceptionally difficult, until modern analogues were found in the fine details of the internal structures. Largely on the basis of such structural details, the crossbedded sand facies is interpreted as the product of small eolian dunes, and the irregularly bedded sand facies is interpreted as deposits of interdune ephemeral streams, ephemeral ponds, and wet to dry

subaerial flats. The mud beds and paleosols at the tops of the sandy units represent times of temporary stabilization of the dune field

**Shinn, E. A.** (1980). Geologic history of Grecian Rocks, Key Largo Coral Reef Marine Sanctuary. In: Bulletin of Marine Science, 30(3), 646-656.

**Abstract:** Grecian Rocks Reef is composed of five major ecologic zones: (1) a deep seaward rubble zone ranging in depth from 6-8 m; (2) a poorly developed spur and groove zone composed of massive head corals and *Millepora*- (4-6 m water depth); (3) a characteristic high-energy oriented *Acropora palmata*- zone extending from the surface down to 4 m; (4) a distinct broad reef flat composed of in situ *A. palmata*- and coral rubble, followed by (5) a narrow low-energy back-reef zone of unoriented *A. palmata*- thickets of *A. cervicornis*-, and various massive head corals in water 0-3 m deep. An extensive grass-covered carbonate sand flat 3-4 m deep extends in a landward direction from zone 5. Cores revealed that all the zones except the massive coral head zone are superficial coatings over a carbonate sand and rubble accumulation. A thin 1-m thick layer of lime mud and peat was found 11.5 m below sea level on the Pleistocene bedrock beneath the sand and rubble in the reef flat core hole. Carbon-14 analyses of coral from 7 m below the reef surface indicate that the reef began growing approximately 6,000 years before present

**Thornton, S. et al.** (1980). Holocene evolution of a coastal lagoon, Lake of Tunis, Tunisia. In: Sedimentology, 27(1), 79-91.

**Abstract:** Historical records demonstrate that the Lake of Tunis, Tunisia, was an open bay that became separated from the Mediterranean by an accreting barrier spit, forming a lagoon. Closure of the lagoon was caused by increased sedimentation as a consequence of Roman deforestation of the Medjerda River drainage basin to the north and subsequent accelerated longshore transport. The separation of the lagoon from the Mediterranean was completed in the early 1500s. At present, the 48 km<sup>SUP</sup>-2 lagoon averages <1 m in depth and reaches eutrophic conditions in the late summer. Consistent with the historical records, the lagoon sedimentary column shows three distinct successive environments of deposition: (1) an arid continental environment; (2) an open marine bay; and (3) the present brackish to hypersaline lagoon. These depositional environments are represented by the lower grey layer, <0.5 m thick, the middle olive-grey layer, 1 to 5 m, and the upper black layer, 1 m thick. All of the strata are predominantly silt plus clay, but usually contain at least 10% sand. The lower grey layer consists of pitted quartz sand, with very few abraded broken molluscan fragments and benthic foraminifera with thick tests. An arid, subaerial depositional environment of latest Pleistocene time best explains these sediments and fossil assemblages. Heavy metal analyses of total samples in five cores demonstrate that Mn and Fe vary randomly, and are apparently derived from natural sources only. Cd, Cr, Pb, Cu and Zn are typically highest in the uppermost unit, which reflects levels of human contamination since closure of the lagoon

**Hudson, J. H.** (1981). Growth Rates in *Montastraea annularis* : A Record of Environmental Change in Key Largo Coral Reef Marine Sanctuary, Florida. In: Bulletin of Marine Science, 31(2), 444-459.

**Abstract:** Annual growth rates of *Montastraea annularis* over the last 50+ years were determined for inshore, midshore, and offshore reef areas within the Key Largo Capra; Reef Marine Sanctuary, Florida. In this study, 144 massive heads of *M. annularis* were sampled by coring and their growth history examined, using X-radiography to facilitate accurate measurement of more than 7,000 individual annual growth increments. Key elements affecting growth and survival of *M. annularis* in the sanctuary appear to be water depth, turbidity, and temperature. *Montastraea annularis* from offshore fore-reef areas grew most slowly, averaging only 6.3 mm of vertical growth per year from 1928 to 1978. Many cores at this location reveal a

long history of environmental stress indicated by numerous healed-over "die-off" voids excavated by various boring organisms, principally boring sponges

**Nelson, H. et al.** (1981). Areas of Active, Large Scale Sand Wave and Ripple Fields With Scour Potential on the Norton Basin Sea Floor. *In: Environmental Assessment Of The Alaskan Continental Shelf. Annual Reports Of Principal Investigators For The Year Ending March 1980. Volume 4: Hazards.* Boulder: Office of Marine Pollution Assessment.

**Abstract:** Strong dynamic currents are present throughout much of the northern Bering Sea, particularly where westward land projections interject into the northward flow, such as in the eastern Bering Strait area. In such regions large bedforms develop and migrate to form an unstable sea floor that can be a potential hazard to platform foundations and pipelines. Such potentially hazardous areas must be identified, their history assessed, and magnitude of future problems predicted. This paper outlines regions of mobile bedforms and presently known aspects of their dynamic activity

**Sharp, J.** (1981). An Assessment of *Ascophyllum nodosum* Harvesting Methods in Southwestern Nova Scotia. *In: Can. Tech. Rep. Fish. Aquat. Sci.* (1012), 33.

**Abstract:** Since 1959 *Ascophyllum nodosum* resources in southwestern Nova Scotia estimated at 180,000 t have exploited at 6,000 t year super(-1) for alginate production by Scotia Marine Products Ltd. The harvesting method has evolved over 18 years from entirely hand methods to 80% mechanical methods. In the summer of 1978, a study examined the effects of mechanical harvesting (the Aguamarine Harvester) and compared them with those of the hand cutter rake. Harvest sites with a known harvest history were examined for residual biomass and population structure and a controlled experiment was conducted in one location. Results of the experiment are presented

**Thorpe, J. E. et al.** (1981). Assessing and managing man's impact on fish genetic resources. *In: Canadian Journal of Fisheries and Aquatic Sciences*, (38), 1899-4907.

**Abstract:** Historically, human activities have adversely affected the genetic resources of many fish species. The authors suggest that a continuum of vulnerability to loss of genetic resources exists for fishes. Primary determinants of vulnerability are extent of stock structure in populations and fundamental life history features, such as length of Juvenile period, sex ratio, and fecundity. The genetic basis for this trend is the relationship between the subdivided state of a population (its stock structure) and important processes of genetic change, which include selection, gene flow, and genetic drift. This study related various human activities to their effects on genetic resources through these genetic processes. In general, the authors found that those species whose populations are subdivided into nearly isolated stocks (e.g., Pacific and Atlantic salmon) are more vulnerable to directional changes in genetic composition as well as reduction in overall genetic diversity through loss of some stocks. It was also found that similar changes will be difficult to detect, if they occur at all, in less stock-structured species like walleye.

**Chauveau, J. P.** (1982). Histoire économique, pêche maritime et situation actuelle dans la région de Palmarin. *In: Rapport De Mission Palmarin-Djifère.* Dakar: Centre de Rech. Océanogr. Dakar-Thiaroye.

**ELOUARD, P., & ROSSO, J. C.** (1982). Eléments de biogéographie et d'écologie des mollusques quaternaires et actuels du Banc d'Arguin (Mauritanie). *In: Géobios*, fasc. 1(15), 105-110.

**Given, R. R.** (1982). The Undersea Science Program at the University of Southern California's

Catalina Marine Science Center. Proceedings Of The Sixth Meeting Of The United States Japan Cooperative Program In Natural Resources Ujnr. Panel On Diving Physiology And Technology, Menlo Park And Catalina Island, California, October 20-26, 1981 (pp. 211-218).

**Abstract** : The University of Southern California has a long history of involvement in marine science, and currently operates an active, multi-disciplinary program under its Institute for Marine and Coastal Studies. The Catalina Marine Science Center is the Institute's off-shore, island-based field station, and supports a program of undergraduate courses, graduate and post-doctoral research, and one of the largest scientific diving programs in the world. Scientists use scuba and manned submersibles to conduct research in nearshore waters. In early 1984, in cooperation with the National Oceanic and Atmospheric Administration (NOAA), USC will begin conducting undersea science from a newly-constructed habitat-saturation diving complex (Western Regional Undersea Laboratory Program). It will be located at the Catalina facility, and will offer aquanauts access to a variety of undersea habitats and terrains

**Thilmans, G., & Descamps, C.** (1982). Amas et tumulus coquillers du delta du Saloum. Recherches scientifiques dans les parcs nationaux du Sénégal (pp. 31-50). Dakar: IFAN.

**Cummings, C. R.** (1983). Defined professional criteria for underwater archaeology. Proceedings Of The Alaskan Marine Archeology Workshop, May 17 19, 1983, Sitka, Alaska (pp. 111-124). Sitka, Alaska: Alaska-Univ.,-Fairbanks-USA.-Alaska-Sea-Grant-Coll.-Program  
**Abstract**: Doing archaeology underwater is in its infancy in relationship to doing archaeology in other environments, and the technology and methodology is still rapidly evolving. While others have adequately described the history and development of this specialty, several points about that development of relevance to this discussion of professional criteria are made in closing

**Park, C.** (1983). East Asia and the Law of the Sea. Seoul Korea : Seoul Natl. Univ. Press *Int. Stud. Ser.* Vol. 5. Incl. bibliogr.: pp. 425 445.

**Abstract**: The historic conclusion of the Third United Nations Conference on the Law of the Sea at Montego Bay, Jamaica, on December 10, 1982 and the eventual coming into force of the new Law of the Sea Convention have made it inevitable for coastal states everywhere to review their maritime problems, bilateral and multilateral, with reference to the new criteria embodied in the Convention. This volume is comprised of fifteen papers selected from among the author's publications of the last ten years. In a different format from the originals, they deal with the legal and geopolitical aspects of offshore oil and fisheries development and related problems in Northeast and Southeast Asia. A postscript at the end of each paper gives references for further reading, and altogether eleven new maps have also been added.

**Smiley, E. T., & Holecek, D. F.** (1983). Aquatic park management: symposium proceedings. Government-Reports,-Announcements-and-Index,-National-Technical-Information-Service-NTIS,-US-Department-of-Commerce (p. (46p.)). East Lansing, USA: Department of Park and Recreation Resources, Michigan State University

**Abstract**: The proceedings cover the following aspects of marine parks: Fathom Five Provincial Park operations and management considerations; diver safety; interpretation as a management tool; systematic approaches to maintenance; historical considerations for the management of underwater parks in Michigan.

**Akimichi, T., & Ruddle, K.** (1984). The historical development of territorial rights and fishery relations in Okinawan inshore waters. *In*: K. Ruddle, & T. Akimichi (eds.), Maritime Institutions In The Western Pacific (pp. 37-88). Suita, Osaka: National Mus. of Ethnology.

**Abstract**: The sub-tropical, small-scale, nearshore fisheries of Okinawa (Japan) historically

have been characterized by the use of a wide range of technologies employed to exploit a large number of benthic and pelagic marine resources. Using original licensing documents, this paper describes and analyzes the basis for the development of formal systems of sea tenure in Okinawa from the early 1870s to the present, examining the changing technologies licensed, geographic ranges of application, and changes in resources thus exploited. Access rights granted to outsiders are discussed using the example of the specialized fishermen from Itoman, Okinawa Island

**Barousseau, J. P.** (1984). Analyse sédimentologique des fonds marins de la Petite Côte (Sénégal). *In: Document Scientifique Du Centre De Recherches Océanographiques De Dakar-Thiaroye*, (94), 23.

**Abstract:** L'étude de 513 prélèvements au sud du Cap-Vert (plateau continental du Sénégal) entre la côte et les fonds de 30 à 50 m permet de caractériser la nature physique des substrats meubles. L'analyse qualitative (teneurs en carbonates) et granulométrique conduit à distinguer sept unités sédimentaires. On a tenté de reconnaître l'empreinte de l'histoire quaternaire récente du plateau concurrentement à l'influence des conditions actuelles ainsi que la part respective des facteurs biogènes et terrigènes.

Les sept unités dénombrées sont les sablons de Gorée, les sables fins du rivage actuel et des cordons littoraux submergés, les sables détritiques fins du Saloum, les sables bioclastiques grossiers des hauts-fonds pré-littoraux, les sables moyens régressif de la plate-forme moyenne et des paléovallées, les sables bioclastiques de la plate forme externe et les sablons du large

**Chauveau, J. P.** (1984). Bibliographie historique du littoral sénégalais et de la pêche maritime (milieu du 15e, début du 20 siècle). *In: Document Scientifique Du Centre De Recherches Océanographiques De Dakar-Thiaroye*, (92, ), 72 .

**Notes:** = Historical bibliography about the Senegalese and Gambian littoral and the marine fisheries (from 15th century to 20th century)

**Abstract:** The author reviews the literature of cruises, socio-economic aspects, fisheries, and historical accounts in Senegal and in Gambia.

**Fernandes, R. M.** (1984). La problématique du changement de la structure familiale chez les Bijagos. (p. 167). Paris: Université de Paris VIII Saint-Denis.

**Odum, W. E.** (1984). The relationship between protected coastal areas and marine fisheries genetic resources. *In: J. McNeely, & K. R. Miller (eds), National Parks, Conservation, And Development. The Role Of Protected Areas In Sustaining Society. Proceedings Of The World Congress On National Parks, Bali, Indonesia, 11 22 October 1982.* (pp. 648-655). [s. l.]: [s. n.].

**Abstract:** The fisheries of the world appear to have reached a plateau in total annual catch between 70 and 80 million metric tons, and are unlikely to exceed 100 million tons per year in the future; between 50 and 75 of the commercial fish catch comes from species which utilize coastal and estuarine waters. This paper reviews the scientific evidence which indicates a strong connection between critical coastal habitats and fisheries production, discusses the need for protection of these critical habitats and reviews a few examples where protected coastal areas contribute significantly to coastal fisheries. The key to effective habitat preservation for benefit of fisheries genetic resources is to protect the complete sequence of critical habitat types encompassing the entire salinity gradient; the preservation of one type of habitat without consideration of functionally connected habitats may lead to disruptions in life history cycles and long-term decline in fishery production

**Polunin, N.** (1984). Do traditional marine "reserves" conserve ? A view of Indonesian and New Guinean evidence. *In: K. Ruddle, & T. Akimichi (eds.), Maritime Institutions In The Western*

Pacific, Chap. 17, (pp. 267-283). Suita,-Osaka-Japan : National Mus. of Ethnology.

**Abstract:** The concept of a "traditional marine conservation ethic" existing among coastal people of Indonesia and Papua New Guinea is evaluated. Tenure probably arose most commonly as a result of conflict over marine areas, and this competition was intensified, not diminished, when certain resources became economically valuable. Exclusive areas became established, not because people wished to conserve resources, but rather because they tended to exploit those areas. Traditional tenure is but one circumstance which might have enhanced any supposed natural Status quo between man and resources existing in the past. Traditional tenure also imposes adverse constraints on coastal zone development and management. Without responsibility on the part of the fisherman, management measures cannot work, but traditional ownership patterns can only be regarded as a very imperfect route to establishing that responsibility, because the ownership exists for gain and not for restraint

**Wilson, K.** (1984). A bibliography of Lough Hyne (Ine) 1687-1982. *In: J. Life Sci.*, 5(1), 1-11. Notes: Incl. 194 refs.

**Abstract:** An annotated bibliography is presented containing 194 references to Lough Hyne (Ine) Nature Reserve, County Cork, Ireland. The papers and unpublished sources cited describe aspects of the biology and ecology of the marine fauna and flora of this unique sea lough. References to the geology, archaeology, history, bathymetry and hydrography of Lough Hyne are also included

**Bell, L. A. J.** (1985). Coastal zone management in Western Samoa. Report Of The Third South Pacific National Parks And Reserves Conference Held In Apia, Western Samoa, 1985. Volume 2. Collected Key Issue And Case Study Papers Noumea New Caledonia: South Pacific Reg. Environment Programme

**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

**Bengtson, J. L.** (1985). Monitoring indicators of possible ecological changes in the Antarctic marine ecosystem. Selected Papers Presented To The Scientific Committee Of Ccamlr, 1982-1984. Part 2. Commission Conserv. Of Antarctic Marine Living Resources, Hobart Australia 1985 (pp. 43-153). [s. l.]: [s. n.].

Notes: Incl. bibliogr. p. 106-122.

**Abstract:** Fisheries assessment, directed ecological studies and ecological monitoring are necessary to provide the information required for ecosystem management. Monitoring of indicator species to indirectly detect ecological trends in the Antarctic marine ecosystem is proposed. The most suitable indicator species for the Antarctic ecosystem are krill predators. Crabeater seals, Antarctic fur seals, chinstrap and Adelie penguins appear to have characteristics which offer the greatest potential as possible indicators of krill harvest-related changes in the ecosystem. The paper briefly reviews the history and present status of Antarctic fisheries. To introduce the topic of the potential effects of harvest-related perturbations, some hypothetical impacts of past and future fisheries are presented

**Dinesen, Z. D.** (1985). Day-to-day management of Capricornia, the first section of the Great Barrier Reef Marine Park. Proceedings of the fifth international coral reef congress (pp. 253-258). Moorea (French Polynesia): Antenne Museum-EPHE

**Abstract:** Following the passing of the Great Barrier Reef Marine Park Act by the Australian

Commonwealth Government in 1975, the first section of the Marine Park to be zoned for management was the Capricornia Section, at the southern extremity of the great Barrier Reef region. Capricornia includes some 30 reefs and shoals, plus a number of vegetated coral cays associated with 13 of the reefs, the majority of these islands being Queensland National Parks. Day-to-day management of the Great Barrier Reef Marine Park is carried out by the Queensland National Parks and Wildlife Service, under a special arrangement whereby the Commonwealth Government provides initial capital funding, and 50% of operating costs. The day-to-day management requirements are outlined in the Management Guidelines formulated jointly by the Commonwealth and Queensland Governments. Day-to-day management of Capricornia has been in operation since 1982. Management operations include: (1) Education/information activities to increase public awareness of the marine park concept, and of the natural history of the area, and to inform park users of details of the Zoning Plan and Regulations relevant to their activities within the Section; (2) Surveillance of the area using aerial and surface patrols; (3) Deterrence, detection of infringements, and law enforcement of the Great Barrier Reef Marine Park Act and various Queensland State legislation such as the Marine Parks Act, the National Parks and Wildlife Act, and the Fauna Conservation Act; (4) Monitoring of the natural resources of the park and of human usage patterns within the park; (5) Resource management activities including the issue of permits, provision of public facilities, and pest and weed control. Aspects of these day-to-day management operations are discussed with reference to specific examples.

**Frazier, J.** (1985). Marine turtles in the Comoro Archipelago. (pp. 177, Incl. 42 fig., 36 tab.). Amsterdam Netherlands: North Holland Publ.

**Abstract:** The book could be organized into four general sections, though there are no individual chapters. The introduction provides background data on the climate, geology, biology, and history of the peoples of the Comores, followed by a brief overview of potential nesting and feeding habitats. The second section, the species accounts, comprises the major part of the text and discusses population size and structure, movements, morphometrics, and breeding biology separately for the green and hawksbill turtles. The third section concentrates on nonhuman and human predation, the status of the habitat, commercial exploitation, legislation, reserves, and a short series of recommendations. The final section contains detailed descriptions of 271 beaches and their turtle spoor, and data on sightings and measurements of all Chelonia and Eretmochelys seen

**Mahe, E.** (1985). Contribution à l'étude scientifique de la région du Banc d'Arguin. (p. 408). Montpellier : Université des Sciences et Techniques du Languedoc.

**Pan, B. S.** (1985). Prediction of histamine formation based on time-temperature history. 2. Use of Arrhenius plot to estimate histamine formation in mackerel and bonito. In: B. S. Pan, & D. James (eds.), Histamine In Marine Products: Production By Bacteria, Measurement And Prediction, Chap. 252, (pp. 21-23). Rome Italy : FAO.

**Abstract:** The effects of temperature on the rate of histamine production in mackerel (*Scomber tapeinocephalus*) and bonito (*Sarda sarda*) were studied. Arrhenius plots were used to prepare charts of induction time and reaction rates for use by the fish industry to approximate histamine production in raw materials during post harvest handling

**Rolle, F.** (1985). Late Cretaceous - Tertiary sediments offshore central West Greenland: Lithostratigraphy, sedimentary evolution, and petroleum potential. In: Canadian Journal of Earth Sciences, 22(7), 1001-1019.

**Abstract:** On the basis of samples and logs supplied to the Geological Survey of Greenland, the sedimentary sequence has been divided into seven new formations: the Campanian

Narssarmit Formation, consisting of coarse basement wash and black mudstone; the Campanian to Eocene Ikermit Formation, consisting of marine organic-rich mudstone; the Upper Paleocene to Eocene Hellefisk Formation, comprising shallow-marine to paralic sandstone and mudstone; the Eocene Nukik Formation, consisting of turbiditic sandstone and mudstone; the Eocene to Oligocene Kangamiut Formation of shelf to shallow-marine clean and argillaceous sandstone; the Oligocene to Neogene Manitsoq Formation, consisting of coarse paralic to fan delta sandstone; and the Neogene Ataneq Formation, consisting of protected shallow-marine mudstone

**Torres, L.** (1985). Historic resource study, Cape Hatteras National Seashore, North Carolina. Vol. 244). Denver, CO (USA).: National Park Serv., Denver Serv. Cent.

**Abstract:** The study includes most of the recommendations made by the Washington Office, region and park in their reviews. The study does attempt to provide an appreciation of the historical significance of the Sea-shore's cultural resources-their role in the cultural heritage of the area, their origins, and how they were employed

**Boulon, R. H., & Dammann, A. E.** (1986). Virgin Islands Biosphere Reserve. Research report No. 8. Map of fishery habitats within the Virgin Islands Biosphere Reserve. Research Report No. 9. Fisheries habitat of the Virgin Islands region of ecological importance to the fishery resources of the Virgin Islands Biosphere Reserve. Research report No. 10. Assessment of fish and shellfish stocks produced in the Biosphere Reserve. *In: Res. Rep. Virgin Islands Biosphere Reserve*, (8-10), 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

**Chauveau, J. P.** (1986). Une histoire maritime africaine est-elle possible? Historiographie et histoire de la navigation et de la pêche africaines à la Côte occidentale depuis le XV<sup>e</sup> siècle. *In: Cahiers D'Etudes Africaines*, 26(1-2), 173-235.

**Rosenberg, A., Beddington, J. R., & Basson, M.** (1986). Growth and longevity of krill during the first decade of pelagic whaling. *In: Nature*, 324(6093), 152-153.

**Abstract:** Krill (*Euphausia superba* Dana), the dominant member of the zooplankton community of the Southern Ocean, has been the subject of study for many years. As the main prey species of the baleen whales, several species of seals and many sea bird, fish and cephalopod species, its importance within the ecosystem is clear. It is important for the practicalities of management of the Southern Ocean to estimate the ability of krill to sustain a harvest by man or by its natural predators. This estimation requires a knowledge of growth and longevity, which in krill are the subject of some controversy. Here the authors have analysed eight years of data on krill taken between 1928 and 1938 and have obtained estimates which consistently indicate high growth rates, modulated by a strong seasonal pattern. The cumulative growth through the year is consistent with the studies of age structure using pigment analysis

**Scott, J. W., & Reuling, M. A.** (1986). Washington public shore guide: Marine waters. \_ (p. 350). Seattle, Wa Usa: University Of Washington Press.

**Abstract:** Washington Public Shore Guide provides information about nearly 700 saltwater public access sites. The sites, which are scattered along Washington's 2,400 miles of marine shore, range from large state parks and wildlife refuges, to simple boat launches, undeveloped road ends, and tidelands which are accessible only by water. There are chapters on the history of the shore, public lands ownership and management, and other topics of general interest. Descriptions of beach, dune, and wetland ecosystems are given, as well as information on the animals that are found along the coastal zone

**Mulcahy, M.** (1987). ROV, navigation technologies make Monitor expedition a success. *In: Sea Technology*, 28(7), 30-35 .

**Abstract:** The wreck of the USS Monitor (off the coast of Cape Hatteras, North Carolina), long a favorite of students of Civil War shipwrecks, played a part in making history of a different sort May 26-June 10. A U.S. Navy fleet tug, remotely operated vehicle and an integrated surfacesubsea navigation system were used together for the first time in an archeological study of a shipwreck. The results have made deepwater archeology a reality. NOAA, as caretaker of the Monitor National Marine Sanctuary, is concerned about what the ultimate disposition of one of the world's most famous shipwrecks should be. Management options in preservation of the shipwreck range from non-interventional to complete recovery. With each return to the site, NOAA deliberately adds to the data base necessary to make the ultimate decisions. The 1987 expedition was crafted to obtain or refine existing data relating to three specific areas: Extent of corrosion of the ship, geographic distribution of artifacts outside the ship's hull; and structural condition of the ship's hull

**Sarr, A.** (1987). Histoire du Sine Saloum. *In: Bulletin De L'Ifan*, t. 46, série B Sciences humaines(3-4), 211-283.

**Notes:** Introduction, bibliographie et notes par Charles Becker

**Abstract:** La chronique d'Alioune Sarr marque l'intérêt majeur de la tradition orale pour la connaissance de l'histoire africaine. Elle apporte des informations originales sur deux formations sociales de Sénégambie - le *Siin* et le *Saalum* - qui étaient commandé par la dynastie Guelwaar. L'introduction et les notes fournissent des renseignements complémentaires, en particulier des remarques critiques et une bibliographie, alors que le document d'A. S. décrit avec détails les origines des deux royaumes, leur organisation sociale, certains règnes marquants et surtout, les événements du XIX<sup>e</sup> siècle. Il apporte aussi plusieurs témoignages écrits inédits sur la conquête française et les débuts de la période coloniale

**Giresse, P., Barusseau, J. P., & Descamps, C.** (1988). Enregistrement sédimentologique et archéologique des oscillations climatiques récentes dans le domaine littoral de l'extrême Ouest africain. Contribution à l'étude des aridifications. Perpignan: Université de Perpignan.

**Giresse, P., Diouf, M., & Barusseau, J. P.** (1988). Lithological, mineralogical and geochemical observation of senegalo-mauritanian quaternary shoreline deposits : possible chronological revisions. *In: Palaeogeography, Palaeoclimatology, Palaeoecology*, (68), 241-257.

**Holland, C. H.** (1988). On the origin of Lough Hyne, Co. Cork. *In: Ir. Nat. J.*, 22(12), 521-527.

**Abstract:** Lough Hyne (or Lough Ine) is situated on the south coast of western County Cork. The site of the Lough is described and its geological origin is speculated. The Lough is now Ireland's first marine preserve

**McClanahan, T., & Muthiga, N.** (1988). Changes in Kenyan coral reef community structure

and function due to exploitation. *In: Hydrobiologia*, (166), 269-276.

**Abstract:** A comparison of Kenyan reefs of different historical and observed levels of fishing exploitation showed that more exploited reef lagoons had greater sea urchin densities and sizes, fewer and smaller fish, and less coral cover. In the most exploited lagoon the biomass of the burrowing sea urchin, *Echinometra mathaei* increased five-fold during the previous 15 years. An ecological study of the three most common omnivorous sea urchin species inhabiting hard substrate within these reef lagoons suggests that they are ecologically separated by predation and avoid predators and competitors by occupying different size burrows or crevices within the lagoon. Predator removal through fishing activities may result in ecological release of the sea urchins and result in competitive exclusion of weaker competitors. The most exploited reef had a nearly mono-specific barren of *F. mathaei* living outside burrows; this result suggests that this species may be the top competitor. Its ecological release appears to lead to a decrease in live coral cover, increased substrate bioerosion, and eventually a loss of topographic complexity, species diversity, fish biomass and utilizable fisheries productivity

**Rogers, C. S., & Teytaud, R.** (1988). Marine and terrestrial ecosystems of the Virgin Islands National Park and Biosphere Reserve. Vol. 124). St. Thomas (USVI): Virgin Islands Resource Management Coop.

**Abstract:** Contents: Physical setting and climate; Marine systems; (History of research, Description of marine systems, Stresses to marine systems); Fisheries; Terrestrial systems; (History of research); Flora and vegetation, Description of terrestrial systems, History of research: Fauna, Stresses to terrestrial systems); Recommendations for future research and management of terrestrial resources; Geology. (Contract NPS-CX-0001-3-0048. Color illustrations reproduced in black and white. Prepared in cooperation with Island Resources Foundation, St. Thomas, VI. Sponsored by Virgin Islands National Park, St. Thomas (USA).)

**Tarnas, D. A.** (1988). The U.S. National Marine Sanctuary Program: An analysis of the program's implementation. *In: Coastal Management*, 16(4), 275-303.

**Abstract:** The U.S. National Marine Sanctuary Program was established in 1972 by Title III of the Marine Protection, Research, and Sanctuaries Act. In this article, the authors discuss the development of the sanctuary concept, and the original intent of Congress, and analyze how it was applied by the sanctuary program. Differences in interpretation of the program's purpose are examined, including discussion of the multiple-use management concept, an important but controversial management technique used in the sanctuaries. The continuing efforts by Congress and the National Oceanic and Atmospheric Administration to clarify the program's purpose are investigated. The program's administrative history is explained and the current sanctuaries and active candidates are briefly described

**Sow, S. H.** (1989). Les rivalités européennes sur la côte Mauritanienne du XVII<sup>e</sup> au XIX<sup>e</sup> siècle, Fort Portendick (1721-1837). FLSH, Nouakchott.

**Claxon, P. G.** (1990). History of scientific research for Gulf Islands National Seashore. Volume 2. *In: Rep. Natl. Park Serv.*, 146.

**Abstract:** The volume provides a narrative history of scientific research at Gulf Islands National Seashore, organized by category and incorporating the most significant research citations from Volume 1. It also provides a comprehensive listing of ongoing scientific research, environmental monitoring, and available park research facilities as of 1984. Volume II also contains a summary of maps, charts and aerial photographs available at the park and from other sources, a summary of computerized databases, and a listing of researchers, individuals, institutions and agencies contacted in the compilation of the report. See also PB93-114858. Sponsored by National Park Service Cooperative Research Unit, New Brunswick, NJ

**Diop, E. S.** (1990). La côte ouest africaine du Saloum (Sénégal) à la Mellacorée (Rep. de Guinée). (p. 379 + 2 tomes + illustrations et planches cartographiques). Dakar: Orstom.

**Ferhat, N., & Aumassip, G.** (1990). Les formations quaternaires du Tijirât méridional (Mauritanie). In: Comptes Rendus De L'Académie Des Sciences, t. 311, série II, 141-146. Bibliog.

**Sara, M.** (1990). Marine parks in Liguria: Naturalistic and management aspects. Marine Parks In The Mediterranean. Biological And Management Aspects (pp. 161-169). San Teodoro: Istituto Delle Civiltà Del Mare

**Abstract:** Details are given of the historical background to and the current situation regarding the marine parks established along the Ligurian coast of Italy: Monte di Portofino, Cinque Terre and the 2 small islands of Gallinara and Bergeggi. The naturalistic and socioeconomic characteristics of each of these areas are outlined. Considering the delay in the establishment of these marine parks, some temporary but rapid measures to be taken regarding the protection of marine areas of interest are proposed

**Baker, E. K.** (1991). Copper and zinc distribution in the sediments of the Fly Delta and Torres Strait. Sustainable Development For Traditional Inhabitants Of The Torres Strait Region. Torres Strait Baseline Study Conference, Cairns, Qld. (Australia), 19 Nov 1990 [s. 1.]: Great Barrier Reef Marine Park Authority *Workshop Ser. Great Barrier Reef Mar. Park Auth.:* Notes: maps, graphs, 12 ref.

**Abstract:** The Fly Delta extends for about 30 k offshore from the southern coast of Papua New Guinea. The area is dominated by fine grained terrestrially derived muds. To the south the region of Torres Strait is represented by predominantly carbonate sediments. High levels of zinc and copper were found to be associated with the terrigenous sediments. The concentrations are comparable to those reported for industrialised areas elsewhere. Possible sources of the metals include erosion and drainage of the highly mineralised rocks found in the catchment area and the input of contaminated mine waste into the system. A linear correlation was found between the copper and zinc concentrations and the distance of sample sites from the estuary. A correlation was also found between the percentage of fine grained particles and copper concentrations. This study indicates that future work should investigate historical changes in copper and zinc concentrations in the sediments and the ultimate fate of metals associated with the particulate matter in the Fly River

**Bennett, B. A., & Attwood, C. G.** (1991). Evidence for recovery of a surf-zone fish assemblage following the establishment of a marine reserve on the southern coast of South Africa. In: Marine Ecology Progress Series, 75(2-3), 173-181.

**Abstract:** This study was designed to establish whether populations of fish species important in the catches of rock and surf anglers increased following the proclamation of the De Hoop Marine Reserve on the southern coast of South Africa. Catch per unit effort (CPUE) and size frequency distributions of angling species were monitored approximately monthly by angling from the shore at 2 sites in the reserve. At one site sampling commenced 2 yr before the reserve was established and continued 4.5 yr there after, allowing comparisons of periods of exploitation and protection. The other site had a long history of minimal exploitation and data collected there 2.5 to 4.5 yr after complete protection was considered to represent an unexploited condition. Ten species accounted for 99% of the catch. Following establishment of the reserve, CPUE increased for 6 of these

**Chia, L. S., & Chou, L. M.** (1991). Coastal area management: New possibilities for Singapore. Urban Coastal Area Management: The Experience Of Singapore. Proceedings Of The

Singapore National Workshop On Urban Coastal Area Management, Republic Of Singapore, 9 10 November 1989. Manila Philippines: ICLARM *ICLARM Conference Proceedings*: Vol. 25.

**Abstract:** The paper first discusses the nature of the coastal environment, the historical development of urban centers along the coast within the Southeast Asian region and the value of coastal resources for economic and social welfare before proceeding with the objectives of coastal area management (CAM). Among the management issues included are how best to satisfy developmental requirements while accommodating environmental needs to cater to the growing demand for the use of coastal resources for recreation and tourism. Highlighted are the new possibilities for utilizing coastal resources such as the creation of a marine park within the Southern Islands and the proposed residential developments on the coastal sites of Simpang, northeast of Singapore, and of Bugis in the Kallang Basin

**Finn, M., & Adey, W. H.** (1991). Mesocosms: Encapsulated ecosystems on display. *In: Sea Technology*, 32(4), 85-90.

**Abstract:** The Smithsonian Institution's Marine Systems Laboratory has been, over the past 12 years, dedicated to developing systems and technologies to permit encapsulation of natural ecosystems in semi-closed, controlled environments. The objective is to create living models of a wide variety of aquatic and wetland ecosystem types. Once established, these mesocosms, composed of hundreds of species, can maintain themselves ecologically, at least in the time frame of a decade or more. In these biologically diverse systems, large numbers of life forms not only survive but reproduce and interact with each other, recreating the natural food web from its base to a limit determined by system size. The mesocosms are whole-estuarine models of the Chesapeake Bay and the Florida Everglades. These models are prototypes for larger system development and ecological research. Two microcosms - the Caribbean Reef/Lagoon and Atlantic Subarctic Coast - are exhibit models on display at the National Museum of Natural History (NMNH) in Washington, D.C. The technology and techniques developed by MSL are currently in use in the MSL-designed Great Barrier Reef Marine Park Authority's 750,000-gallon aquarium, the million-gallon ocean/estuarine system of the Biosphere II project in Arizona, as well as a number of smaller projects scattered around the world

**Fitzpatrick, J.** (1991). Maza: A legend about culture and the sea. Sustainable Development For Traditional Inhabitants Of The Torres Strait Region. Torres Strait Baseline Study Conference, Cairns, Qld. (Australia), 19 Nov 1990 Townsville, Qld Australia: Great Barrier Reef Marine Park Authority *Workshop Ser. Great Barrier Reef Mar. Park Auth.:*

Notes: 2 maps, 17 ref.

**Abstract:** A Western Torres Strait myth is used to illustrate the connection between sea territories and culture; the social links among people; and the value of the seascape. It is a story about Aukum, a legendary woman who symbolises the fertility of the reef. Her abundant, daily fish catch is shared with relatives and while she traverses the numerous marine zones deep water passages, platform reefs and the fringing home island reefs she stocks many reefs of Western Torres Strait with fish. This paper documents how peoples' lives are dependent on the vitality of the local seascape, and in particular the reef, Maza. It is argued that cultural identity is based on historical, symbolic and social associations with the sea and interminable use of the marine environment by Western Torres Strait Islanders

**Mackintosh, B.** (1991). National parks: Shaping the system. (p. 129). Washington, DC (USA): National Park Serv.

**Abstract:** The book tells the story of the evolution of the U.S. National Park System. It begins by discussing the origins of the System and describes the complexity of the System's designations. It then chronicles the step-by-step growth of the System from its beginnings to its 357 areas at the beginning of 1991. Part 3 contains maps showing the extent of the System, a

listing of areas outside but affiliated with the System, and a list of all National Park Service directors with their tenures. An index completes the book

**Mitchell, B., & Barborak, J. R.** (1991). Developing coastal park systems in the tropics: Planning in the Turks and Caicos Islands. *In: Coastal Management*, 19(1), 113-134.

**Abstract:** A new national park system is being developed in the Turks and Caicos Islands, a sparsely populated archipelago at the southern extreme of the Bahamian platform. The small area supports pristine reef complexes, large tidal flats, nesting seabird colonies, and endangered species such as the green turtle (*Chelonia mydas*), humpback whale (*Megaptera novaengliae*), and Kirtland's warbler (*Dendroica kirtlandii*). The habitats are threatened by a recent boom in tourism and land development. In 1987, the Turks and Caicos government identified 32 marine and terrestrial sites for future designation as national parks, nature reserves, sanctuaries, and historical sites. A strategy for long-term financial support and training for development of a park system is discussed, including local management and enforcement capabilities

**Petit-Maitre, N., & Schulz, E.** (1991). Data on holocene vegetation in the Atlantic sahara. *In: Palaeo Ecology of Africa*, (15), 199-200.

**Pitcher, R.** (1991). Research for sustainable development of the tropical rock lobster fishery in Torres Strait. Sustainable Development For Traditional Inhabitants Of The Torres Strait Region. Torres Strait Baseline Study Conference, Cairns, Qld. (Australia), 19 Nov 1990 Townsville, Qld Australia: Great Barrier Reef Marine Park Authority *Workshop Ser. Great Barrier Reef Mar. Park Auth.:*

Notes: 16 ref.

**Abstract:** The commercial fishery for the tropical rock lobster is a major source of income for Torres Strait Islanders. Research results on the life history, mortality, sources of recruitment, abundance, and catch characteristics of the lobster and the fishery are briefly outlined. Research will continue to be synthesized into models that provide the basis for enlightened management

**Bathily, M.** (1992). Néolithique moyen à final, littoral et continental d'un secteur saharien : le Nord-Ouest mauritanien (régions du Tijirât et de l'Agneîtîr). Université de Paris I. Institut d'Art et d'Archéologie. Centre de Recherches Africaines, Paris.

**Bathily, M.** (1992). Néolithique moyen à final, littoral et continental d'un secteur saharien : le Nord-Ouest mauritanien (régions du Tijirât et de l'Agneîtîr). (p. 750). Paris: Université de Paris I ; Institut d'Art et d'Archéologie ; Centre de Recherches Africaines.

**Bousquet, B.** (1992). Guide des parcs nationaux d'Afrique: Afrique du Nord, Afrique de l'Ouest. (pp. 368 ; fig., maps, pl., tab.; ref. ). Lausanne; Switzerland : Delachaux et Niestle.

**Abstract:** Designed for nature tourists and ecologists, this book offers an illustrated guide to 43 national parks in North and West Africa. Following a general introductory section which looks at the history and development of conservation in Africa and of the national park system, the following two chapters examine their major objectives, those of maintaining the natural equilibrium and biodiversity and developing and preserving natural renewable resources, through tourism, fishing, fauna and forests. The next chapter then considers in turn the principal types of natural environment in Africa, looking at coastal and mountain areas, forests, scrubland, deserts and savanna. Aspects of management of national parks and their flora and fauna are also discussed. The main part of the book then presents a classification of the national parks in Africa by country, giving for each a description, a map, a list of animals, practical advice and details on the type of institutional organization and impact of human activity. The countries covered are Algeria, Benin, Burkina Faso, Cote d'Ivoire, Guinea, Mali, Morocco,

Mauritania, Niger, Senegal, Togo and Tunisia

**Hawkes, M. W.** (1992). Seaweed biodiversity and marine conservation in the Pacific Northwest. *In: Northwest Environ. J.*, 8(1), 146-148.

**Abstract:** Research on the biodiversity of seaweed is ongoing in three main areas. First, we are examining the natural history and systematics of the Pacific Northwest benthic (bottom-dwelling) marine plant (seaweed) flora. Basic natural history and inventory work is an important prerequisite for marine conservation because you need to know what you have before you can make decisions about sustainable resource use or protection. The Pacific Northwest is blessed with one of the richest and most diverse seaweed floras in the world with some 639 taxa in 281 genera documented to date. However, we still do not have a complete inventory of our coastal marine plants. In addition to documenting marine plant biodiversity in the Pacific Northwest, I am also interested in their distribution, ecology, and modes of reproduction. As noted by Soule and Kohm, such baseline data are a "vitally needed prerequisite for rational planning and for the preservation of biological diversity." A recent attempt to ascertain which seaweeds in our area may be rare or endangered demonstrated the need for more data on distribution and abundance, especially in northern British Columbia and in the subtidal zone. Second, the reproductive biology and population genetic diversity of marine plants must be studied. Most seaweeds can reproduce both sexually and asexually; such variations in the breeding system can have important effects on genetic diversity. However, we know very little about breeding systems in the seaweeds and even less about genetic diversity, both amount and distribution, at the population level. Such information is essential for the design of conservation schemes or for assessing environmental impacts of human-caused disturbances, such as oil spills, on coastal biodiversity. In the absence of such data we have no way of knowing what levels of diversity are present and therefore what levels of diversity may be lost if not protected

**Barker, B.** (1993). Early human exploitation of island environments within the Great Barrier Reef Marine Park. *In: Reef Research*, 3(3), 13-14.

**Abstract:** A brief discussion is presented on archaeological evidence of early human exploitation of coastal and island environments within the Great Barrier Reef Marine Park, considering in particular findings from the Whitsunday Islands. The relatively small population meant that resource levels were maintained and detrimental impacts to the environment were kept to a minimum. There is no evidence of overexploitation of resources which would have resulted in a change in size of shellfish, crustacean or fish biota through time

**Becker, C.** (1993). Vestiges historiques, témoins matériels du passé dans les pays sereer. Dakar: Orstom.

**Bohnsack, J. A.** (1993). Marine reserves. They enhance fisheries, reduce conflicts, and protect resources. *In: Oceanus*, 36(3), 63-71.

**Abstract:** For the first time in human history, we have the ability to catch fish faster than they are produced. Our catch ability must be tempered with new ways of preventing overfishing and resource depletion. Marine fishery reserves, areas protected from all fishing and other harvesting activities, provide one approach. Since the first modern reserves were established in the mid-1970s, they have been increasingly used for fisheries management and resource protection

**Buxton, C. D.** (1993). Life-history changes in exploited reef fishes on the east coast of South Africa. *In: Environmental Biology of Fishes*, 36(1), 47-63.

**Abstract:** The impact of exploitation on various life-history characteristics of 2 sex changing, reef-dwelling sparid species was examined by comparing populations protected in a large

marine reserve with those adjacent to the reserve. Like other sparids, *Chrysolephus laticeps* and *C. cristiceps* grow slowly and are long lived, reaching ages of 17 and 21 years, respectively. No significant differences in the growth rate of *C. laticeps* were measured, but growth in *C. cristiceps* was significantly slower in the exploited population. Observed data showed that sex ratios outside the marine reserve were skewed towards the females, a result of size selective exploitation. Size at sex change was also significantly smaller for *C. cristiceps* in the exploited area, but not so for *C. laticeps*. This difference between the species was explained as a function of the size at recruitment into the fishery and the degree of protection afforded both large females and male fish. Considering the possibility that reproduction could be impaired as a result of changes in population structure, the tactic of protection through marine reserves is supported as a hedge against recruitment failure

**DeMartini, E.** (1993). Modeling the potential of fishery reserves for managing Pacific coral reef fishes. *In: Fishery Bulletin*, (91), 414-427.

**Abstract:** The potential use of marine fishery reserves (MFRs) for managing fisheries on tropical Pacific coral reefs was assessed using the Beverton-Holt model. The effects of year-round fishery closures on harvests in adjacent 1.14 exploited areas were evaluated. Potential changes in spawning stock biomass per recruit (SSB/R) and yield per recruit  $\sim$ /R) were estimated from published data, approximated natural and fishery mortality rates, size- and maturity-at-age distributions, and transfer (emigration and immigration) rates. For select cases, fundamental transfer rates were adjusted for possible density dependent emigration from closed areas as relative densities decreased in surrounding nonclosed areas because of continued fishing. Three hypothetical "fish types" were constructed, bracketing the likely extremes in fundamental transfer rates - and related life-history parameters of Pacific coral reef fishes: a small-bodied, fast-growing and short-lived, strongly philopatric species of damselfish was contrasted with a large-bodied, relatively slow-growing, long-lived, vagile species of jack. A "surgeonfish" type was used to represent intermediate parameter values. Simulations corroborate previous observations that MFRs contribute little, if anything, towards increasing Y/R. Results for highly vagile jack confirm that rapid transfer rates will negate potential gains in SSB/R resulting from closures. At the opposite extreme, small reef philopatriots like damselfishes would almost never be harvested, because of negligible transfer rates, unless the MFR was periodically opened to fishing. The simulations suggest that the SSB/R of surgeonfish type is the most likely to benefit from MFRs, because moderate vagility allows biomass to accumulate within the closure despite harvesting in the nonclosed area. Results further suggest that growth rate, fishing effort in the nonclosed (open) area, natural mortality, maturity, and harvesting schedules influence the potential of MFRs to augment SSB when transfer rates are low to moderate

**Gladstone, W.** (1993). The history of crown-of-thorns starfish controls on the Great Barrier Reef and an assessment of future needs for controls. Workshop on the Possible Causes and Consequences of Outbreaks of the Crown of Thorns Starfish, Townsville, Qld. (Australia), 10 Jun 1992 Townsville, Qld. (Australia): Great Barrier Reef Marine Park Authority  
Notes: 20 ref.

**Abstract:** The Great Barrier Reef Marine Park Authority is planning for the next series of outbreaks of crown-of-thorns starfish (*Acanthaster planci*) by developing a contingency plan. Part of the plan is devoted to the feasibility and desirability of primary controls aimed at preventing the southwards spread of outbreaks. The history of the Authority's policy on controls, the results of past and present controls and reasons for their success or failure are reviewed. The arguments likely to be raised for widespread controls in the event of another outbreak are discussed. The feasibility of such controls is examined in terms of costs, possible effectiveness, side effects and alternatives

**Howorth, P. C., & Hudson, D. T.** (1993). Submerged archaeological and historical sites in the Channel Islands National Park and Channel Islands National Marine Sanctuary. Third California Islands Symposium: Recent Advances in Research on the California Islands. Santa Barbara : Museum of Natural History

**Abstract:** The waters of the Channel Islands National Park and Channel Islands National Marine Sanctuary contain numerous submerged archaeological and historical sites. Stone artifacts discovered in 18 submerged archaeological sites span the period from some 9,000 years ago to recent history. The remains of shipwrecks cover the period from possibly as early as Cabrillo's voyage (1542-1543) to the present and includes 105 wreck sites

**Kane, A.** (1993). Evolution historique et découpage du littoral sénégalais. *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. 23-27). Gland, Suisse: UICN.

**Kyle, R.** (1993). Towards the wise use of the fishes of the Kosi Bay Nature Reserve. Fish, Fishers And Fisheries. Proceedings Of The Second South African Marine Linefish Symposium Held In Durban 23-24 October 1992 Durban South Africa: Oceanographic Research Institute

**Abstract:** The Kosi Bay estuarine system has a long history of human exploitation of its fish and other resources. Traditional methods have been developed locally and some of these, such as the fishtraps, have remained little changed in construction or intensity in recent years. Other methods, such as gill netting, are more recent developments and the intensity of their use is great, albeit that the method is illegal and discouraged. The estuarine system and immediate surroundings were proclaimed a Nature Reserve in 1987 by the KwaZulu Government. The KwaZulu Bureau of Natural Resources is the body controlling the area and it has a policy of allowing the wise utilisation of renewable natural resources. All utilisation must thus be reviewed under this policy in the light of the latest scientific knowledge of the impacts of the different methods

**Ludwig, D., Hilborn, R., & Walters, C.** (1993). Uncertainty, resource exploitation, and conservation: lessons from history. *In:* Science, (260), 17-36.

**Nagao, Y. et al.** (1993). "ODAIBA" sea purification and city resort concept. International Perspectives On Coastal Ocean Utilization. Proceedings Of The Second International Symposium On Coastal Ocean Space Utilization Cosu Ii Held April 2-4, 1991 In Long Beach, California Los Angeles USA: University of Southern California. Sea Grant Publ.

**Abstract:** "ODAIBA" is located in the north end of the Tokyo Bay just in front of the metropolitan area. Six artificial islands with breakwaters were built in 1853, and two of them remain now. Among them, ODAIBA No. 3, with two old breakwaters, plays the role of sheltering a small trapeziform semi enclosed sea area. ODAIBA are historic and unique offshore civil engineering structures which have been accommodating wild sea birds and small animals like lizards and snakes. Such a natural place is quite exceptional in Tokyo Bay, which is totally surrounded by industrialized port and harbor facilities. This semi enclosed sea area had been used as a temporary floating area for wood logs, but is now designated by the Tokyo Metropolitan Office as a sea park for recreational sports like boardsailing, traditional boating and recreational fishing. However, the water is contaminated and the seabed cannot be seen, although the average depth is less than three meters. On the other hand, there will be a "Tokyo Frontier" in 1994, a big international exposition to celebrate its decades long construction project in the Tokyo waterfront. This paper proposes a new concept of resort which includes purification and restoration of the sea. The concept will create clean and beautiful sea areas by purifying water and improving bottom quality with advanced technologies. This will provide

opportunities to touch and play with sea life for those who live and work in the area and visit the exposition. ODAIBA purification and city resort concept will be able to demonstrate a solution for cleaning up sea areas adjacent to big cities and is a great idea for a seaside oasis in a highly industrialized metropolitan area.

**Stump, R.** (1993). Life history characteristics of *Acanthaster planci* (L.) populations, potential clues to causes of outbreaks. Workshop on the Possible Causes and Consequences of Outbreaks of the Crown of Thorns Starfish, Townsville, Qld. (Australia), 10 Jun 1992 Townsville, Qld. (Australia): Great Barrier Reef Marine Park Authority

Notes: 33 ref.

**Abstract:** A novel method of age determination using pigment band counts in aboral spines has offered potential insights into *Acanthaster planci* population biology. In *A. planci* growth, longevity and reproductive effort appear to be determined by the interaction between available coral resources and population density. Maximum determined ages ranged up to 12+ years, indicating that longevity is considerably greater than estimated from outbreak population studies. A qualitative model of population dynamics is presented to explain how a primary outbreak may be initiated. In particular hydrodynamic conditions, low density populations may seed intermediate populations with consistent age structure, through successive small-scale recruitment over several years. Further successful recruitment increases population density to a point where the switch between low density and outbreak phenotypic states is triggered in the developing recruits. Phenotypic expression of life history characteristics that promote reproductive success in high density populations suggests that outbreaks have occurred in the past over a long time-scale. It is still possible that increased recent activity is related to environmental stress on the reefs

**Zann, L.** (1993). Some perspectives on the *Acanthaster* phenomenon. Workshop on the Possible Causes and Consequences of Outbreaks of the Crown of Thorns Starfish, Townsville, Qld. (Australia), 10 Jun 1992 Townsville, Qld. (Australia): Great Barrier Reef Marine Park Authority

Notes: Summary only.

**Abstract:** Although outbreaks of *Acanthaster planci*, the crown-of-thorns starfish (COTS) have occurred in many widely separated coral reefs of the Indo-Pacific over the past 30 years, research on the phenomenon and its causes has almost exclusively centred on the Great Barrier Reef. This study takes a wider view, examining the recent history of COTS in other parts of the Indo-Pacific, especially the geographically isolated groups in the South Pacific. Outbreak histories were reconstructed from oral histories, published and unpublished reports, and dedicated studies. The outbreak histories in the main study groups and subgroups were related to their geographical and geomorphological characteristics, and the extent of anthropogenic impact

**Anundsen, K. et al.** (1994). Late-glacial and Early Holocene sea-level fluctuations in the central Puget Lowland, Washington, inferred from lake sediments. *In: Quaternary Research*, 42(2), 149-161.

**Abstract:** Analyses of sediments, diatoms, and pollen in a 12.65 m long sediment core taken from Lake Carpenter in the central Puget Lowland, Washington, provide detailed information regarding the history of deglaciation and late glacial/early Holocene sea level changes. The lake outlet, now 8.2 m above sea level, has been lowered 1-1.5 m by postglacial erosion. The lithology and pollen record suggest that no lengthy hiatuses in sedimentation have occurred. The basal sediments are glacialmarine and contain shell fragments and brackish/marine diatoms. Freshwater sediments above the basal section are interrupted only by a short section containing few fossils, most of which are brackish to marine indicators and by the Mazama

tephra at 9.5 m. The pollen record in the basal 4 m reveals a *Pinus* zone (ca. 13,850-11,000 yr B.P.) with a brief peak of *Picea* at ca. 13,700 yr B.P., and an *Alnus/Pseudotsuga* zone (ca. 11,000-6500 yr B.P.). The chronology is based on nine radiocarbon ages. A relative lowering of sea level below the 9.5 m threshold is recorded in the core at 12.41 m and dates 13,850 to 13,700 yr B.P. A marine episode occurred about 13,600 yr B.P., implying that relative sea-level temporarily rose above 9.5 m. No subsequent transgressions above the 9.5 m level have been recorded. Comparison of six radiocarbon dates greater than or equal to 13,600 yr B.P. suggest that the marine reservoir correction of 760 yr currently used for this area may be too high for this time period

**Bouju, S.** (1994). Le morcellement identitaire des populations littorales: quelques éléments de l'histoire du peuplement. 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

**Davis, G. E., Faulkner, K. R., & Halvorson, W. L.** (1994). Ecological monitoring in Channel Islands National Park, California. The Fourth California Islands Symposium: Update on the Status of Resources. Santa Barbara, CA (USA), 1994 Santa Barbara: Museum of Natural History

**Abstract:** Natural resource managers need to understand the natural functioning of and threats to ecosystems under their management. They need a long term monitoring program to gather information on ecosystem health, establish empirical limits of variation, diagnose abnormal conditions, and identify potential agents of change. The approach used to design such a program at Channel Islands National Park, California, may be applied to other ecosystems worldwide. The design of the monitoring program began with a conceptual model of the park ecosystem. Indicator species from each ecosystem component were selected using a Delphi approach. Scientists identified parameters of population dynamics to measure, such as abundance, distribution, age structure, reproductive effort, and growth rate. Short term design studies were conducted to develop monitoring protocols for pinnipeds, seabirds, rocky intertidal communities, kelp forest communities, terrestrial vertebrates, land birds, terrestrial vegetation, fishery harvest, visitors, weather, sand beach and coastal lagoon, and terrestrial invertebrates (indicated in priority order set by park staff). Monitoring information provides park and natural resource managers with useful products for planning, program evaluation, and critical issue identification. It also provides the scientific community with an ecosystem wide framework of population information

**Dingwall, P. R. et al.** (1994). Antarctica/New Zealand. Protecting nature: regional reviews of protected areas (pp. 229-254, 31 ref.). [s. l.]: [s. n.].

**Abstract:** This paper, which provides a review of protected areas in Antarctica/New Zealand, is divided into three parts covering: New Zealand, Antarctica and the islands of the Southern Ocean. These parts are subdivided into sections which provide: an historical perspective of the current protected area coverage, including marine reserves, sites under international recognition, and protection of private land; current levels of financial investment in protected areas; priorities for future investment in protected areas; and some of the major issues surrounding protected areas, for example, the introduction of animals and plants, and the impacts of tourism. A concluding section discusses some of the future priorities for action in each region.

**Lima, J. T.** (1994). Shipwreck research program at Channel Islands National Park. The Fourth California Islands Symposium: Update on the Status of Resources Santa Barbara : Museum of Natural History

**Abstract:** Shipwreck research programs yield data on specific vessels and the overall context

of the vessels in maritime activities. Channel Islands National Park has an ongoing research program to identify, document, and locate vessels lost in the vicinity of Anacapa, Santa Cruz, Santa Rosa, San Miguel, and Santa Barbara islands. The methodology for identifying and documenting vessels and the general maritime history of the area is discussed using examples from the ongoing research program

**Lucas, J.** (1994). The biology, exploitation, and mariculture of giant clams (Tridacnidae). *In: Reviews in Fisheries Science*, 2(3), 181-224.

**Abstract:** Eight giant clam (Tridacnidae) species have been overfished for meat and shells throughout their tropical Indo-Pacific distributions. The 1960s through the 1980s were particularly severe for the two largest species, due in part to international poaching for their adductor muscle meat. Low densities, erratic recruitment, and a relatively long period to reach harvestable size make these populations prone to overfishing. Declining giant clam stocks and local extinctions were a major stimulus for research into mariculture methods. The life of cycles of most species are well understood and a variety of mariculture methods have been developed (Tridacna and Hippopus for the 2 genera). However, heavy mortality of the early juvenile stages remains a problem. Recent research has revealed new aspects of giant clam biology, such as the housing of their symbiotic zooxanthellae in a unique complex diverticulum of the stomach. Research has quantified dual modes of nutrition (photosynthates from zooxanthellae and effective filter feeding) that give giant clams a nutritional and growth advantage over normal heterotrophic bivalves. Whereas the economics of giant clam farming have been demonstrated, commercial farming is still in its infancy. Conservation measures, such as development of marine reserves, establishing breeding aggregations, and restocking wild populations with cultured clams, have only been attempted to a limited extent

**McNeill, S. E.** (1994). The selection and design of marine protected areas: Australia as a case study. *In: Biodiversity and Conservation*, 3(7), 586-605.

**Abstract:** Recently there has been increased interest in the use of Marine Protected Areas (MPAs) as tools for the conservation of marine habitats and species. This has resulted in the declaration of many MPAs around the world. Despite this activity there have been few tests of hypotheses about the design criteria for selection and management of these areas, resulting in a haphazard and ad hoc selection of protected areas, with conflicting and inconsistent terminology and objectives. The application of appropriately tested scientific information to the design of MPAs will increase the likelihood of success in the future. To 1st January 1992, 267 MPAs had been declared in Australia, covering a total area of ca 400 019 km<sup>2</sup>. The history of their declaration has been sporadic and uneven. Conflicts over State and Federal legislation and, within states, conflicts over jurisdiction among agencies caused by overlapping responsibilities, have at times slowed the declaration of MPAs. In this paper, the history of MPAs in Australia is used as a case study to discuss the problems, both biological and administrative, of declaring MPAs

**Miller, J., & Campbell, C. E.** (1994). A marine geographic information system for the Channel Islands National Marine Sanctuary. The Fourth California Islands Symposium: Update on the Status of Resources Santa Barbara : Museum of Natural History

**Abstract:** In 1980, the U.S. Congress designated the waters surrounding San Miguel, Santa Rosa, Santa Cruz, Anacapa, and Santa Barbara islands as the Channel Islands National Marine Sanctuary, 1 of 13 national marine sanctuaries in the United States. The sanctuary Management Plan identifies 4 goals: resource protection, research, interpretation, and visitor use. The sanctuary staff have identified 3 key uses of a geographic information system (GIS) that will help achieve these goals: site characterization, monitoring, and disaster preparation. A GIS in this case, a marine GIS is a tool that the sanctuary staff can utilize to map resources and analyze

the effects of man or nature on the environment of the sanctuary

**Morton, B.** (1994). Hong Kong's coral communities: Status, threats and management plans. *In* : Marine Pollution Bulletin, 29(1-3), 74-83.

**Abstract:** This paper reviews the sparse literature on Hong Kong's scleractinian coral communities and explains, in terms of a locally complex climate and hydrography, the broad aspects of their distribution. Corals are restricted to the less polluted, oceanic, eastern waters of Hong Kong and are most diverse in the middle reaches of protected bays from CD to similar to -10 m CD. Historical evidence suggests that local corals were once more widely distributed but that the settlement of Hong Kong, particularly since its colonization in 1841, has progressively restricted them. Coral collection for lime burning was common until World War II, but has since stopped. Local coral communities, therefore, started anew some 50 yr ago. In recent years, the economic development of Hong Kong has, through uncontrolled pollution, destroyed many coral areas, notably in Tolo Harbour. Today, construction of the new Chek Lap Kok airport and associated infrastructure, requires the dredging of >500 million m<sup>3</sup> of marine sands. Dredging operations in eastern waters have destroyed coral communities, through silt suffocation. Other reclamations and borrow areas have also adversely affected corals. Legislation is being drafted and plans are being developed to create marine parks and reserves in Hong Kong. The proposed marine park at Hoi Ha Wan is to try and protect a local coral community. The proposed marine reserve at Cape d'Aguilar is also a coral area within the framework of a more wave-dynamic habitat. Existing legislation has not hitherto protected Hong Kong's corals. The proposed legislation may help, but the reality is that only remnants of what once must have been a spectacular coral community may survive in the territory's remotest bays

**Ramos-Espla, A., & McNeill, S. E.** (1994). The status of marine conservation in Spain. *In*: Ocean & Coastal Management, 24(2), 125-138.

**Abstract:** The history of declaration of marine protected areas (MPAs) in Spain is short. The first marine protected area was declared in 1982. Up to December 1993, nine areas were declared, protecting a combined area of 15 000 ha. (0.5%) of the coastline. A variety of nomenclature has been used-fishery preserved zones, hunting refuges, marine reserves, marine-terrestrial park-and MPAs have been declared under different legislation. Perhaps as a consequence, the objectives of MPAs (species, habitats, restocking living resources) are diverse and there is a very uneven distribution of types of habitat protected and of protected areas between the Mediterranean and Atlantic coast. The administrative system of protection and management of marine areas is complex, shared between central and regional governments. There is, however, one piece of legislation that has been specifically tailored for the marine environment which allows the creation of 'marine reserves'. To date, five reserves have been declared using this legislation. The problems encountered in the establishment and vigilance of MPAs and solutions implemented have resulted in a logical system for the declaration of future MPAs. The use of MPAs as a management tool for the protection of marine habitats and species is gaining impetus in Spain, with eleven new protected areas proposed

**Russ, G., & Alcalá, A. C.** (1994). Sumilon Island reserve: 20 years of hopes and frustration. *In*: Naga, 17(3), 8-12 .

**Abstract:** Over 20 years, successive openings and closures of the Sumilon Island marine reserve to fishers have provided unique opportunities to examine the effects of marine reserves on populations and communities of fishes and upon local fisheries. The history of the reserve also highlights the problems and frustrations of educating and convincing people of the need for rational management of renewable marine resources. Yet, it is a symbol of hope in that it has provided a unique example of the potential benefits of marine reserves in fisheries

management, particularly in the developing world

**Schwartz, M. W.** (1994). Conflicting goals for conserving biodiversity: Issues of scale and value. *In: Natural Areas Journal*, (14), 21-216.

**Abstract:** Differing conservation values create a multiplicity of goals toward which conservation activities are directed. Multiple and differing goals also are inherent in conservation at differing spatial and temporal scales. In many cases these different goals result in management actions that are complementary and that simultaneously benefit many species and habitats. In contrast, there are instances in which conservation for one set of values, or at one spatial scale, suggests a management action that would violate other conservation goals. The author defined the goals and value systems used to support biological conservation and presented three cases where differing conservation objectives conflict. Specifically, this study addressed how 1) a proposed translocation of an endangered species outside its historic range, to prevent its extinction, would violate the historic integrity of the recipient community; 2) the use of fire, to maintain plant community composition in grasslands, may threaten native insect biodiversity; and 3) assisting the process of long-distance seed dispersal to aid plant-range shifts disrupted by anthropogenic climatic warming, would violate the integrity of recipient plant communities. While examples of conflicting goals are not hard to describe, they are hard to resolve and pose challenges to conservation biology that are not adequately addressed at the present time. Increased use of goal-setting would improve our ability to explicitly measure the success of conservation projects. Failure to set priorities and goals in conservation management implies a misplaced faith in the balance of nature.

**Smith, P. J.** (1994). Genetic diversity of marine fisheries resources: possible impacts of fishing. (p. 53). Rome: FAO.

**Abstract:** This report reviews the evidence for the genetic impact of fishing on marine fisheries resources. The most widely used method for measuring genetic diversity in natural populations has been protein electrophoresis; marine teleosts have levels of genetic diversity ranging from 0-18 percent and marine invertebrates from 0-32 percent. Genetic studies have shown that populations of marine species are less differentiated than freshwater species, experience temporal changes, can be changed locally by pollution, and contain cryptic species. In natural populations fishing is a major source of mortality and is non random with respect to age and size of individuals. A common observation in heavily exploited teleost fisheries has been a decline in the age and/or size at sexual maturity. Size selective fishing would favor early maturity. However, growth rate in some fishes is density dependent and increases when the stock is reduced. Thus it is not possible to determine if the observed changes are genetic or compensatory in response to reduced stock density. Genetic drift is unlikely to be a major factor influencing levels of genetic diversity in many marine fisheries, except for some populations which have been reduced to near extinction levels. There is no evidence for loss of genetic diversity in collapsed stocks of pelagic species. The use of hatcheries to produce seed for aquaculture and enhancement could lead to loss of genetic diversity in natural populations through escape of farm stock or inappropriate choice of broodstock. Experimental studies are required to determine the heritability and the response to selection of life history characters of exploited species, and to determine if relaxation of fishing pressure allows the recovery of fast growing and late maturing genes or gene complexes in populations. A combination of experimental and field studies would permit a more rigorous testing of genetic changes in exploited populations. If genetic changes are demonstrated in exploited species then changes to management would be needed to conserve natural levels of diversity.

**Suman, D.** (1994). Extension of the Wilderness Act to marine areas: Application to the Florida Keys. *In: Bulletin of Marine Science*, 54(3), 1085.

**Abstract:** The Wilderness Act of 1964 establishes a National Wilderness Preservation System of lands where human influence is unnoticeable, thus, providing outstanding opportunities for solitude and unconfined types of recreation. Today over 546 separate areas covering about 95 million acres have wilderness designation and are managed by four federal agencies. My paper analyzes the language of the Wilderness Act, its legislative history, and wilderness ethics, and argues for expansion of the Act to cover marine areas under jurisdiction of the National Park Service, the National Marine Sanctuary Program of NOAA, and the US Fish & Wildlife Service. The Florida Keys provide the case studies for my analysis. Several current federal management regimes approximate wilderness designation. These regimes cover areas of Biscayne National Park, proposed zones of the Florida Keys National Marine Sanctuary, and "backcountry" portions of the National Wildlife Refuges in the Florida Keys. My analysis distinguishes these management regimes from wilderness areas and argues that, nevertheless, there remains a need for marine wilderness areas. I propose regulations for different marine wilderness areas in the Florida Keys and describe some possible user group conflicts that might arise were rules to be promulgated

**Untawale, A. G., & Dhargalkar, V. K.** (1994). Eco-tourism potential along the Indian coasts. Proceedings Of Seminar On Ocean And Industry Realities And Expectations Held On October 25 And 26, 1994 At National Institute Of Oceanography, Dona Paula, Goa (pp. 100-106). New Delhi : India Soc. Of Ocean Sci. And Technol.

**Abstract:** Tourism has recently become one of the major industries in India. The concentration of tourism in India is on the historical as well as religious places, hill stations and to some extent the beaches. Eco-tourism is a new concept being considered in India for creating awareness in education, research, conservation, sustainable utilization and management of flora and fauna. India has several biosphere reserves, marine parks and sanctuaries having different eco-biological components and uniqueness in flora and fauna. These reserves have attracted several domestic and foreign tourists. However, in spite of the very interesting scenic spots with rich biodiversity, these areas have not received much attention for eco-tourism due to the lack of tourist oriented spots recreation as well as infrastructural facilities and poor media coverage highlighting the unique and varied biota of the region. It is however, necessary to have proper management plan with stringent measures to control pollution and minimize the impact of tourism on the coastal ecosystems, keeping in view the total carrying capacity of the area

**Barousseau, J. P., Bâ, M., & Descamps, C.** (1995). Coastal evolution in Senegal and Mauritania at  $10^3$ ,  $10^2$  and  $10^1$  year scales : natural and human records. *In: Quaternary International*, 29/30, 61-73.

**Burnett, W. J.** (1995). Techniques for allozyme electrophoretic analysis of zoanthid samples. *In: Aust. Inst. Mar. Sci.*, 20, 30.

**Abstract:** The Zoanthidae (zoanthids) form an order of the Anthozoa (Cnidaria) in the sub-class Hexacorallia, which also includes the Actiniaria (sea anemones), Antipatharia (black corals), Ceriantharia (tube anemones), Corallimorpharia and Scleractinia (stony corals). Like most of these groups, the zoanthids have historically proven taxonomically difficult. Zoanthid samples were collected inter-tidally, using SCUBA or snorkel, from a large number of localities in the Great Barrier Reef Marine Park and the Torres Strait (Australia). Allozyme electrophoresis was used to identify species boundaries in zoanthids and to allow a rigorous revision of the order. Exact details of experimental protocols, of great value to future workers, are provided, with particular emphasis on the initial surveys of enzyme activity, determination of optimum running conditions and the correct interpretation of allozyme banding patterns, all of which represent a major investment of time and effort.

**Dybdahl, M. F.** (1995). Selection on life-history traits across a wave exposure gradient in the tidepool copepod *Tigriopus californicus* (Baker). In: Journal of Experimental Marine Biology and Ecology, 192(2), 195-210.

**Abstract:** Marine intertidal organisms inhabiting different wave exposure regimes can face different abiotic conditions and selection regimes. In this paper, salinity and temperature conditions for the tidepool habitat of the marine copepod *Tigriopus californicus* (Baker) are described across a wave exposure gradient, and the selective impact of salinity on life-history traits is inferred from laboratory and field studies. I found that desiccation and osmotic stress in the tidepool habitat of *T. californicus* were higher at an outer coast compared to a protected site in California. In the outer coast area with high wave action, tidepool salinity varied spatially, fluctuated temporally, and was at least two times greater than seawater salinity on average; tidepools frequently dried completely. Conversely, tidepool salinity in the protected area with low wave action was moderate and did not vary spatially or temporally. Culturing females at different salinities and temperatures suggested that there is a trade-off between osmoregulatory maintenance and growth or reproduction. At high salinity age of first reproduction and interclutch interval increased, and reproductive rate decreased. Extreme salinity produced age-specific mortality in the laboratory, where juveniles suffered significantly greater mortality than adults in salinity stress experiments. Hypersaline conditions in seven natural tidepool populations were associated with a decrease in the proportion of the population composed of juveniles, and an increase in the proportion of adult females, suggesting that juveniles experienced higher mortality. Unlike previous studies of benthic organisms outside tidepools, I found that higher osmotic and desiccation stress occurred in *T. californicus* tidepool habitats in areas exposed to high wave energy, not in protected areas. The effects of abiotic conditions on life history traits and age-specific mortality suggest the selection exists for local adaptation to different wave exposure regimes

**Kelleher, G.** (1995). History of the marine protected areas report. Sustainable Financing Mechanisms For Coral Reef Conservation: Proceedings Of A Workshop (pp. 10-12). Washington, Dc Usa : World Bank

**Abstract:** A Global Representative System of Marine Protected Areas (MPAs). What does the term mean? It means a representative of every kind of marine ecosystem that exists in the sea. These four volumes represent a combination of nine years work by three institutions-the World Conservation Union (IUCN), the Great Barrier Reef Marine Park Authority (GBRMPA) and The World Bank. The program started in 1975 when IUCN recognized the problem of potential threat to the integrity of much of the world's marine resources. In 1979 the GBRMPA realized it as well. In the First General Assembly of IUCN, a resolution was adopted to work toward creation of a global representative system of MPAs. In that same year a resolution was passed by the World Wilderness Congress in Colorado

**McClanahan, T., & Obura, D.** (1995). Status of Kenyan coral reefs. In: Coastal Management, 23(1), 57-76.

**Abstract:** The existence of four marine parks and numerous reefs experiencing intense human resource use has provided the opportunity for a number of studies that have helped increase the understanding of human impacts on Kenyan reefs. Studies indicate that the removal of finfish is having the largest impact on unprotected reefs and has a number of secondary and tertiary effects on other faunal groups and ecological processes. A high abundance of sea urchins in unprotected reefs result from reductions in sea urchin predators - largely due to overfishing. High sea urchin populations are associated with reefs with lower coral cover, topographic complexity, and reduced calcium carbonate deposition rates. One reef was converted into a marine park during the study period (1987 to 1994) and showed rapid recovery in coral cover and fish abundance and diversity. Some species of gastropod appear to be affected by shell

collecting, but the total fauna seems more affected by removal of their finfish predators. River sediment discharges and eutrophication are of secondary importance but are not severe as yet; they are difficult to distinguish from natural variations over geologic history. We briefly suggest alternative management and research actions for Kenyan reefs on the basis of their existing management

**Merlen, G.** (1995). Use and misuse of the seas around the Galapagos Archipelago. *In: Oryx*, 29(2), 99-106.

**Abstract:** Although the Galapagos Islands were first colonized over 160 years ago, the major impact on the marine resources by local fishermen has occurred only during the last 40-45 years. During this period, and especially more recently, a lack of attention to the largely uncontrolled fishery has led to confusion, a conflict of interests, and a series of inapplicable laws and regulations. Changing markets, exploding human populations, and a new approach to marine resource exploitation, with minimum investment and maximum expectation, has led to a chaotic situation in which neither the fishermen nor the Galapagos National Park will ultimately benefit

**Rabb, G. B.** (1995). The Evolution of Zoos, Aquaria, and Botanic Gardens in Relation to Protected Areas. Part II Partnerships with Major Sectors. Chapter 11. *In: J. McNeely (ed.), Expanding Partnerships in Conservation*. Washington, D.C.; Covelo, California: Island Press.

**Roberts, C. et al.** (1995). Review of the use of marine fishery reserves in the U.S. southeastern Atlantic. Chap. NMF~SEFSC -376, ). [s. l.]: National Marine Fisheries Service//Southeast Fisheries Science Center.

**Abstract:** At the request of the South Atlantic Fishery Management Council (SAFMC), a panel of scientists was assembled at a special symposium at the 1995 annual American Fisheries Society meeting in Tampa, Florida. The specific objectives of the symposium were to provide the SAFMC and the National Marine Fisheries Service with recommendations and guidance on the possible use of permanently protected areas for fisheries management in the southeastern US. This report summarizes the historical background of marine reserves in the southeastern U.S. It is concluded that marine reserves can be an effective management tool used in conjunction with other fishery management measures subject to the following constraints: 1) biological, ecological, social and economic objectives of the reserves are clearly specified, 2) the relative biological, ecological, social and economic impacts of reserves in the context of other fishery management measure have been estimated for various constituents, and 3) the development of marine reserve proposals proceed with the involvement of all constituencies and stakeholders.

**Santos, R. S. et al.** (1995). Marine research, resources and conservation in the Azores. *In: Aquatic Conservation: Marine and Freshwater Ecosystems*, 5(4), 311-354.

**Abstract:** A history of marine research on the Azores is outlined. Until two decades ago most oceanic and littoral marine studies had been carried out by foreign scientists. Studies by Azorean scientists started to increase in the early 1980s when the University of the Azores was created. Ocean circulation in this part of the Atlantic is described as a background for biogeography and diversity. The picture emerges that Azores is a 'meeting point' for shallow water marine fauna and flora of different origins. The species composition of one of the best studied groups of organisms, the fish, is compared between locations in the northeastern Atlantic. The work on fish is also compared with other well studied groups (algae and hydroids) to highlight the interest of the Azores as a natural biogeographical experiment. Studies of marine resources began less than two decades ago. The development of demersal fisheries is described focusing on the switch from small-scale artisanal fishing to more commercial

fisheries. Conservation of species and legislation in force for molluscs, crustaceans, fishes, marine turtles, seabirds and marine mammals are summarized. Protected marine areas already designated are defined, as well as new areas recommended. The paper concludes with a discussion of current threats and future management strategies

**Sheridan, A. K.** (1995). The genetic impacts of human activities on wild fish populations. *In: Reviews in Fisheries Science*, (3), 91408.

**Abstract:** A review of the literature confirms that human activities have caused genetic changes in some wild fish populations, with most of these changes being adverse. These genetic effects include a reduction in growth rate and/or possibly in age/size at sexual maturity in some heavily fished populations. There was also considerable evidence of hybridization between wild and released populations and the extinction of some wild populations due to habitat changes and to competition and/or predation from introduced species. There is a need to monitor wild fish populations for genetic changes, with particular emphasis on exploited populations of prominent economic or recreational value. This is best done by directly examining either the genome or gene products. In order to detect genetic change, it is necessary to have access to at least two chronologically distinct samples of the same population. As DNA is also relatively inexpensive to store, DNA depositories could be established in order to provide a historical record of the genetic composition of populations of either commercial or scientific interest.

**Trexler, J.** (1995). Implications of population genetics and life history evolution for the management of Florida Keys fishes. *In: Bulletin of Marine Science*, 54(3), 1087.

**Notes:** Abstract only.

**Abstract:** The management of fish populations in the Florida Keys should consider the consequences of man's activities for genetic variation of fish life histories. Population genetic structure yields information about the scale over which population processes are carried out, but spatial patterns of genetic variation assessed by molecular techniques may not correspond to spatial patterns of genetic variation for life history traits. The consequences of activities such as size selective fishing for fish stocks, therefore, cannot be predicted from population structure alone. Sailfin mollies from the Florida Keys, where these species are ubiquitous, illustrate this point. Life history patterns, physiological adaptations to salinity variation, and allozymes vary on different spatial scales in Keys populations. Should morphologically distinct local populations in the Florida Keys ever be extirpated, efforts to reestablish them should consider all types of genetic variation. The implications of these observation for reef fish management and the design of marine reserves will be discussed

**Van Ness, J. et al.** (1995). The biological reserve: the future's last stand. *In: Futures*, 27(4), 437-446.

**Abstract:** This article addresses the societal and cultural aspects of bioserves and environmental restoration programmes. It begins with a discussion of bioserves, then uses the example of a Man and Biosphere (MAB) inspired study of the US Everglades to illustrate how land has been shaped historically by culture and technology. It then demonstrates how current conflicts of values and culture, from both inside and outside the region, from interest groups with both pragmatic and emotional stances, are determining the future of an environment-the Everglades. The article thereby shows how human values and perceptions impact on the development of a sustainable Everglades, using the findings of surveys and public meetings to highlight the interests of the competing communities, ethnic and interest groups involved. If bioserves are to survive they cannot become alienated from the people in the regions in which they are located.

**Wojan, T. R.** (1995). Ecotourism in El Nido, Palawan: Possibilities of the Commons. *In:*

Coast. Manage. Trop. Asia, (4), 15-17.

**Abstract:** The El Nido Marine Reserve, Bacuit Bay, is located on the northern tip of Palawan in the Philippine archipelago. The greatest achievement of the Reserve has been to zone areas of the bay for different uses. Despite the significant regulatory powers of the Department of Environment and Natural Resources (DENR), it is unlikely that a satisfactory regulatory solution to the problems of marine and terrestrial carrying capacity will be found. An outline is given of an alternative approach to understanding the problems of developing ecologically sustainable tourist activities. The most significant difference of the alternative approach is that greater prominence is given to the cultural and historical constraints in the formation of a sustainable ecotourism strategy. It is hoped that an increased understanding of the problem will aid the political discussions taking place between the DENR, the local population, concerning NGOs and others with an interest in tourist development and conservation in the area

**Barr, B.** (1996). Mariculture in offshore critical habitat areas: Stellwagen Bank National Marine Sanctuary case study. Open Ocean Aquaculture. Proceedings Of An International Conference, May 9 10, 1996, Portland, Maine. Portland, Maine.: [s. n.]

**Abstract:** While the history of offshore mariculture in New England has been short, it has also been almost uniformly controversial. Perhaps this is true of all new ideas in a conservative place like coastal New England, where the familiar and the known are valued commodities. However, with what remains of the harvesting sector competing for fewer and fewer fish, the outlook for recovery of the wild stocks decades away, and the likelihood that commercial fishing will be a much different industry after that recovery than is it now, the luxury of objecting to change, to new ideas, may no longer be a viable option

**Bohnsack, J. A.** (1996). The impacts of fishing on coral reefs. *In: Biological Conservation*, 76(2), 211.

**Abstract:** Fishing has significantly reduced populations of some reef species, particularly larger species which are often top predators. Reef organisms tend to be vulnerable to overfishing because of life history characteristics that are not adapted to high adult mortality associated with fishing. Reduced fish populations can indirectly impact coral reefs particularly by changing patterns of predation and herbivory which are important structuring forces in coral reef ecosystems. Marine fishery reserves offer opportunities to better understand the impacts of fishing on coral reef health and function

**Chansang, H., & Phongsuwan, N.** (1996). Health of fringing reefs of Asia through a decade of change: a case history from Phuket Island, Thailand. *In: Biological Conservation*, 76(2), 217.

**Abstract:** Data from 1980-1992 show a decrease of live coral cover in five transects, whereas coral cover increased at one site and remained more or less the same at the other. Of the sites which showed a decline in coral cover, the causes of decline were natural causes (Acanthaster predation, storm damage, coral bleaching) and man-made effects, (boat anchoring, damage from tourists, coral collection, fishing in reef areas and possibly eutrophication).

**Dowling, R., & Alder, J.** (1996). Shark Bay, Western Australia: Managing a coastal world heritage area. *In: Coast. Manage. Trop. Asia*, (6), 17-21.

**Abstract:** A brief account is given of the use and management of Shark Bay in Western Australia. This bay contains an unusual blend of geological, biological and climatic factors which combine to form an extraordinary environment with many features of scientific and historic interest. A number of parks and reserves have been created in the region. Tourism, recreation, fisheries and solar salt are the major activities in the Shark Bay Region. The current tourist boom is placing great pressure on the Region's sensitive and fragile environment. Methods of ensuring greater protection include the establishment of more national and marine

parks and reserves, greater on-site management, as well as through a public environmental awareness programme with increased interpretive material. Tourism may well be the future source of development for the Shark Bay Region, but this development will only be realized in a well planned framework. It is hoped that the World Heritage Area Strategic Plan and the Shark Bay Regional Strategy will set this framework. The former coordinates and integrates the management of the marine and terrestrial reserves system and where possible compliments exiting plans and strategies, whereas the latter coordinates and integrates all existing and future plans, and guides the development and use of areas and activities outside the scope of existing plans.

**Haberman, S.** (1996). Landmarks in the History of Actuarial Science (up to 1919). *In: Insurance: Mathematics and Economics*, 18(2), 153-154.

**Kulbicki, M. et al.** (1996). Les peuplements de poissons de la réserve marine du récif Abore (Nouvelle-Calédonie): composition scientifique, structures trophique et démographique avant l'ouverture à la pêche. *In: Doc. Sci. Tech. Cent. ORSTOM Noumea*, 1(1), 210.

**Abstract:** An inventory of the fish assemblages was undertaken in a marine reserve of New Caledonia. Part of this reserve will be soon open to fishing. This study has two parts, on one hand the study of the fish assemblages and on the other hand the study of commercially or recreationnaly important species. The reserve covers 80 km<sup>2</sup>, with three major biotopes, the reef flat, the dropoff and a submerged reef of branching *Acropora*, called locally the "forest". A total of 32 stations were sampled by 32 transects for fish assemblages and 157 transects for commercial fish species. These stations are distributed equally among 6 zones, each zone being divided into the three biotopes (reef flat, dropoff, forest). A total of 340 species were observed, of which 147 were of commercial interest. The dropoff had the most species (254), the reef flat and the forest having a similar number of species (204 and 206). The average density was 3.6 fishm super(2) (*Clupeidae* excluded), the highest densities being on the dropoff (3.65 fishm super(2)) and the lowest in the forest (1.9 fishm super(2)). The density of commercial species (0.91 fishm super(2)) followed the same trends. The major families in density were the Pomacentridae, Labridae, Scaridae, Acanthuridae, Mullidae and Chaetodontidae. The species composition in density changed from one biotope to the next, the major families remaining the same. The most abundant commercial species were the Scaridae and Acanthuridae. The average biomass was 338 gm super(2), however if the very large and rare species (sharks and rays) were excluded, then the biomass was of 262 gm super(2). Nearly 70% of the biomass was made of commercial species. The dropoff had the highest biomass (326 gm super(2)) and the reef flat the lowest (195 gm super(2)). The benthic macrocarnivores had the most species (96), followed by the herbivores (62 species), the microcarnivores, zooplanktivores and piscivores having a similar number of species (from 38 to 43). There was no difference between biotopes in the trophic structure in species number. Zooplanktivores were the most abundant with the herbivores, these two categories totaling more than 70% of the total density. The variability between biotope of the abundance of the various trophic groups was small. Biomass was dominated by macrocarnivores and herbivores, whereas zooplanktivores represented only a low proportion of the biomass. There were more piscivores in the forest than in the other biotopes. The biomass of herbivores increased with the amount of hard substrate. The analysis of the size structure suggests migrations with age between biotopes and different growth rates depending on the biotope for a large number of species. The distribution of the life history strategies suggested that the most stable assemblages were found in the least disturbed biotopes (forest and bays in the reef), and the least stable being found on the reef flat. Most of the stock was in the forest, this biotope having a large area. The families contributing the most to the commercial stock were the Scaridae and Acanthuridae, however, *Plectropomus leopardus* was the major commercial single species. The MSY was grossly estimated. The fishing effort

needed to reach this MSY is well beyond the local fishing potential. However, the fishing effort should not be distributed evenly, the reef flat and the dropoff being much easier to fish, whereas these biotopes support only 20% of the commercial stock

**Lugo, A. E.** (1996). Preservation of primary forests in the Luquillo Mountains, Puerto Rico. *In: Biological Conservation*, 76(2), 215.

**Abstract:** The Caribbean National Forest, a National Forest under the jurisdiction of the US Forest Service and a UNESCO Biosphere Reserve, contains the only primary tropical forests in Puerto Rico. The planning for future uses of the Caribbean National Forest has been controversial and serves as a case study of the application of federal regulations designed for continental temperate zones to insular tropical conditions. Given the history of custodial management of the forest by the US Forest Service, it appears unlikely that the agency will advocate conversion of the only primary tropical forests under US Government jurisdiction in order to satisfy requirements of the National Wilderness Act and/or the National Forest Planning Act. The planning, management, and conservation of the Caribbean National Forest can be a model for such activities elsewhere in the Caribbean and the American tropics but only if it demonstrates a balance between intensive use of suitable stands and absolute protection of primary forests.

**Lydon, S.** (1996). From slaughterhouse to sanctuary: The historic evolution of Monterey Bay. *In: J. W. Markham, & A. L. Duda Tradition and Innovation: Planning Our Future. 22. Annu. Conf. of IAMSLIC, Monterey Bay, CA (USA), 13-18 Oct 1996* (pp. 171-172). [s. 1.]: IAMSLIC.

**Abstract:** How did the peoples of Monterey Bay, the other Bay Area, evolve from resource users to resources conservators; or were they always conservators? Mr. Lydon explored the unnatural history of the region beginning with the first human inhabitants and ending with a perspective on the current ones. Monterey Bay has been home to people with varied ethnic backgrounds, political outlooks, and social needs. Yet, all have used the fantastic natural resources of the area. The long history (in Western American scale) of use and abuse, exploitation and conservation of natural resources has produced a community willing to work together to make the Monterey Bay Marine Sanctuary. Perhaps, the relationships among different ethnic groups nurtured this spirit of cooperation

**Marshall, S. S., Jennings, S., & Polunin, N.** (1996). Seychelles' marine protected areas: comparative structure and status of reef fish communities. *In: Biological Conservation*, 75(3), 201-209.

**Abstract:** Effective management of Seychelles' reef resources is essential because the conflicting demands of fishing, tourism and conservation must be reconciled if sustainable development and the protection of natural resources is to be assured. Marine protected areas play a key role in the existing management strategy and yet there is little quantitative understanding of the benefits they may provide. We compare the biomass and species richness of fish assemblages on coral and granitic reef habitats in four areas which receive different levels of protection from fishing and other human activities. Species richness of the total fish community, biomass of the total fish community and species richness and biomass of many families were higher on both coralline and granitic reefs in two marine protected areas where protective regulations were effectively enforced. However, the biomass of the three principal families of fishes targeted by the fishery was significantly lower in one of these areas. This was attributed to illegal fishing and the fishing concessions offered to local people. We conclude that poaching and minor fishing concessions did not affect the aspects of the fish community which are important to most tourist visitors (biomass and overall species richness), but that they have a statistically significant effect on the structure of the fish community. Furthermore, whilst

a small well-patrolled area will provide an effective refuge from fishing, it will often be stocked by larval fishes which are the progeny of adults living many kilometres away. As such, the protected area cannot operate in isolation to maintain biomass and diversity. A valid long-term aim of reserve management may be to assure the protection of a greater proportion of Seychelles' fishes throughout their life history. This may be achieved if current plans for the management of marine protected areas can be instituted.

**Rodriguez-Ramirez, A. et al.** (1996). Recent coastal evolution of the donana national park (SW Spain). *In: Quaternary Science Reviews*, 15(8-9), 803-809.

**Rundle, G. E.** (1996). History of conservation reserves in the south-west of Western Australia. *In: Journal of Royal Society of WA* 79, 225-240.

**Schug, D. M.** (1996). International maritime boundaries and indigenous people; The case of the Torres Strait. *In: Marine Policy*, 20(3), 209-222.

**Abstract:** The peripheral role indigenous maritime communities have played in the establishment of colonial and State boundaries is illustrated with the case of the indigenous people of the Torres Strait. An historical analysis examines events which shaped the political borders in the region. Particular attention is given to the bilateral Treaty establishing the international boundary between Australia and Papua New Guinea. The Treaty acknowledges the rights of the indigenous people, but their lack of opportunities to participate meaningfully in the formulation and administration of the border regime has placed local communities in conflict with Treaty administrators.

**Smith, S.** (1996). Status and recent history of coral reefs at the CARICOMP network of Caribbean marine laboratories. *In: Biological Conservation*, 76(2), 215.

**Abstract:** Fourteen of 19 Caribbean marine laboratory members of the CARICOMP (Caribbean Coastal Marine Productivity) network responded to a questionnaire requesting qualitative information on the historical and present status of the coral reefs selected for long-term research in the program. Eight of the 14 sites indicated that coral cover had recently declined. While much of the loss was attributed to natural events, nutrient-loading, sedimentation, and over-fishing were also implicated. Six sites reported algal cover as medium to high (10- > 30%), the suspected result of reduced herbivory by over-fishing, *Diadema antillarum* mortality, and nutrient-loading. Nine of the sites reporting are located in marine parks, preserves, or areas of restricted access. Generally, coral cover has remained stable at these sites, except where threatened or damaged by direct tourist impact or distant forest clearing causing coastal sedimentation

**Stump, R.** (1996). An investigation to describe the population dynamics of *Acanthaster planci* (L.) around Lizard Island, Cairns section, Great Barrier Reef Marine Park. *Tech Rep Crc Reef Res Cent* Vol. 10 (p. 56). Townsville (Australia): Cooperative Research Cent. for the Ecologically Sustainable Development of the Great Barrier Reef.

**Abstract:** Renewed reports of *Acanthaster planci* (L.) in the northern Cairns section of the Great Barrier Reef Marine Park, Queensland (Australia) have prompted opinion that the third episode of large scale outbreaks since 1960 is developing in the region. A lack of data on population dynamics and inconsistent use of survey methods have failed to identify the early stages of outbreaks. This project aimed to investigate methods to describe *A. planci* population dynamics off Lizard Island through a series of three field exercises using mark, release, recapture (MRR) techniques and the application of a novel method of age determination, using counts of pigment bands on cleaned aboral spine ossicles. The potential significant contribution of MRR population dynamics studies in understanding *A. planci*

outbreaks was demonstrated and a unique opportunity exists to describe patterns of temporal and latitudinal recruitment, population dynamics and growth, as well as gathering the complementary data required to assess variation in the life history characteristics of growth, mortality and reproduction

**Adachi, M., Matsumoto, Y., & Miyake, Y.** (1997). Liability for water-related accidents and points to consider in developing waterside environments. *In: Journal of Rural Planning Association*, 16(2), 120-128.

**Abstract:** Citing court cases involving water-related accidents over the period 1967-97 [location not specified in author abstract], the legal responsibility for accidents that have occurred at water parks is explained, and various points for constructing these parks considered. Regarding accidents in which the behaviour of the victims could have been predicted, it is apparent that attempts have been made to hold the management of such facilities liable in cases where people gather, structures that should have been designed to discourage lack of climbing, lack of safety prevention measures, past history of accidents, etc. Accident prevention measures for three stages of the development of water parks are formulated: planning, design and post completion. At the planning stage, there must be a thorough understanding of locational conditions and past history of accidents; at the design stage, safety features are incorporated into the design after considering and predicting behavioural patterns of users; and at the post completion stage, periodic inspection and maintenance must be undertaken after completion of the project, and elements that can be considered dangerous should be removed before any accidents or other problems occur

**Anderson, D.** (1997). Coastal cutthroat trout use of the Redwood Creek Estuary, Redwood National and State Parks, California. *In: J. D. Hall, P. A. Bisson, & R. E. Gresswell* Sea Run Cutthroat Trout: Biology, Management, And Future Conservation. Oregon Chapter (p. 177). Corvallis, Oregon Usa : American Fisheries Society.

**Abstract:** The Redwood Creek estuary has suffered habitat loss and degradation due to land-use activities, flood-control levees, and artificial breaching. Agricultural activities have degraded water quality and sea-run cutthroat trout streams, and removed riparian vegetation. U.S. Army Corps of Engineers flood-control levees have changed circulation and sedimentation patterns, resulting in 47% of the lower estuary (between 0 and 4 feet [1.2 m] mean sea level) being filled with sediment or becoming isolated from the embayment. Uncontrolled artificial breaching of the beach sand berm to alleviate summer flooding of adjacent land reduces fish rearing habitat in the estuary. Historically, the estuary and its associated tributaries were known for their cutthroat trout fishery. Redwood National and State Parks has conducted estuary beach seining during the summer and fall months to monitor salmonid utilization. Though not found in large numbers compared to juvenile chinook salmon and steelhead, coastal cutthroat trout are present annually and several age classes are represented. For the years 1990 through 1995, cutthroat trout were present in the estuary during the entire period of monitoring, from June through September October. Age-class composition of 142 cutthroat trout seined in the estuary during summerfall 1983 was age 1: 0.7%, age 2: 25.4%, age 3: 61.3%, age 4: 12.0%, and age 5: 0.7%. Fork length ranged from 110 to 381 mm, with a mean of 225 mm. Statistical evaluation of electrophoretic data from this anadromous population appears to show that it is composed of nonhybridized individuals. Though degraded, the estuary still serves as important salmonid habitat and demonstrates the value of small coastal estuaries to the coastal cutthroat trout.

**Ballantine, W.** (1997). 'No-take' marine reserve networks support fisheries. *In: D. A. Hancock, D. Smith, A. Grant, & J. P. Beumer* (eds.), Developing and sustaining world fisheries resources. The state of science and management (pp. 702-706). Collingwood-Australia : CSIRO.

**Abstract:** 'No-take' marine reserves offer a new and additional form of fisheries management. Over the past 20 years, New Zealand has demonstrated that such reserves are practical and provide valuable support for science, education, recreation, conservation and social economics. A representative network is now the official aim. This is an opportunity for fisheries management to upgrade its aims and avoid the traps of data-dependent, stocks-specific management. While retaining detailed management for particular fisheries, the provision of a 'no-take' network would inject a new level of decision based on general principles - including ecosystem dynamics, the overall public interest, and the need for insurance against human error and natural disasters. Recent history strongly suggests this move would be actively supported by the general public.

**Bishop, C. A., & Brodie, W. B.** (1997). Evaluation of offshore closed areas as a fisheries management tool, with emphasis on two case studies. *In: Sci. Coun. Res. Doc. Nafo*, 19.

**Abstract:** This paper provides an evaluation, mainly in the form of case studies, of the effectiveness of the use of offshore closed areas/seasons that have been used as management tools for fish stocks in two different areas. It looks at the history and effectiveness of the use of this type of MPA (Marine Protected Area) for: 1) haddock (*Melanogrammus aeglefinus*) stocks on the Scotian Shelf and Georges Bank and 2) North Sea plaice, (*Pleuronectes platessa*)

**Broadwater, J. D. et al.** (1997). Applying modern technology to save a historic warship: The Monitor National Marine Sanctuary. *Proceedings Of Oceans '97. Volume 1. Oceans '97, Halifax, NS (Canada), 6-9 Oct 1997* (p. 766 pp). Washington: Marine Technology Society; IEEE.

**Abstract:** On March 9, 1862 the ironclad warships USS Monitor and CSS Virginia (ex-USS Merrimack) fought to a draw at Hampton Roads, Virginia, in one of the most recognized sea battles in history. Now, 135 years later, the Monitor is fighting a losing battle against both natural and human threats. The Monitor's hull, lying in 230 ft. (71 m) of water off Cape Hatteras, North Carolina, is deteriorating at an alarming rate. The National Oceanic and Atmospheric Administration (NOAA) is responsible for the Monitor which, in 1975, was designated America's first National Marine Sanctuary. As a result, NOAA is aggressively applying comprehensive planning strategy and ocean technology to the problem of protecting the Monitor.

**Duff, J. A., & Brownlow, R.** (1997). National Marine Sanctuaries Act. *In: Water Log.*, 17(1), 7-9.

**Abstract:** Congress enacted Title III of the Marine Protection Research and Sanctuaries Act ("Sanctuaries Act") in 1972 to protect marine sanctuaries that, "possess conservation, recreational, ecological, historical, research, educational, or esthetic qualities which give them special significance." National Marine Sanctuaries can be created in one of two ways. The Secretary of Commerce may designate sanctuaries pursuant to the Sanctuaries Act. Alternatively, Congress may directly designate a sanctuary. In January 1976, the Secretary of Commerce designated the Monitor National Marine Sanctuary to protect the historic Civil War ironclad USS Monitor. Since then sanctuaries have been designated in areas ranging from areas in the Gulf of Mexico to Hawaii to Washington State to New England. These sanctuaries primarily protect marine resources such as coral reefs and sea life.

**King, A., & Malleret-King, D.** (1997). Small fisheries research in Kwale District. *In: J. Hoorweg (ed.), Environmental management, research and training in coast province, Kenya*, Chap. 1, (pp. 31-34). Nairobi Kenya: Acts Press.

**Abstract:** Two studies were conducted, one focusing on fishing farming production systems and the other on governance and resource management among the Digo community at Kinondo.

location, Kwale district, Kenya. The community is on the fringe of heavy tourism development, depending on the common pool resources of marine and terrestrial environment for their existence. The area has suffered significant environmental degradation over the last ten years as illustrated by reduced fish catches and lost forest which has led to threatened livelihood and greater pressure on remaining resources. Historically, the community had a traditional form of fisheries management. However, the transition through colonial administration and conversion of the Digo community to Islam, a new structure of authority was created thus slowly by slowly the traditional regimes have been undermined over time and responsibility shifted away from the community both physically and socially. Over time therefore, the management regime has changed from communal governance to state governance, which in general has been ineffective due to among other things lack of funds, leading to a laissez-faire regime. The consequence of this has been a collapse of the fish resources. More time and effort is now being used to catch far fewer fish, which detracts people from the time used previously for cultivating subsistence crops. Subsequently, marine reserve and fishermen committee strategies have been introduced to alleviate the management situation. However, the former strategy which was being implemented by KWS was forced to withdraw due to fears by the community that implementation of a marine reserve was a first step to a marine park which would eliminate their only source of livelihood. From the above it is abundantly clear that interaction between community and government is a key factor to influencing both the natural and human components of ecosystem and the impact on natural environment

**Lipcius, R. N. et al.** (1997). Hydrodynamic decoupling of recruitment, habitat quality and adult abundance in the Caribbean spiny lobster: source-sink dynamics? *In: Marine and Freshwater Research*, 48(8), 807-815 .

Notes: 5. Int. Conf. and Workshop on Lobster Biology and Management, Queenstown (New Zealand), 10-14 Feb 1997

**Abstract**: Marine species possess dispersive stages that interconnect subpopulations, which may inhabit 'source' and 'sink' habitats, where reproduction and emigration either exceed or fall short of mortality and immigration, respectively. Postlarval supply, juvenile density and adult abundance of the Caribbean spiny lobster, *Panulirus argus*, were measured at four widely separated sites spanning >100 km in Exuma Sound, Bahamas. Adult abundance was lowest at a site with the highest postlarval supply and little nursery habitat; hence, it was tentatively classified as a sink. Circulation in Exuma Sound is dominated by large-scale gyres which apparently concentrate and advect postlarvae toward the nominal sink. The remaining three sites, including one marine reserve, had higher adult abundances despite lower postlarval supply, and are therefore tentatively classified as sources. Postlarval supply is probably decoupled from adult abundance by physical transport. Adult abundance is likely decoupled from postlarval supply by the effects of varying habitat quality upon postlarval and juvenile survival, as indicated by non-significant differences among sites in juvenile density. It appears that some sites with suitable settlement and nursery habitat are sources of spawning stock for *Panulirus argus*, whereas others with poor habitat are sinks despite sufficient postlarval influx

**Martinez, J. E., Valdes-Pizzini, M., & Creswell, R. L.** (1997). Culture, Rationality, and Development: Historical Constructions and Distortions of Conservation Efforts in the Fisheries of Southwestern Puerto Rico. Vol. 49 (pp. 419-429). [s. l.]: [s. n.].

**Abstract**: A historical analysis of the fisheries in southwestern Puerto Rico suggests that government development efforts (both local and federal) have contributed to the depletion of marine resources, while advocating conservation practices. Local fishermen have also developed, through years of daily contact with resources, perceptions and cultural constructions about conservation and unsustainable practices. It is argued that productive and social processes in the fisheries are heavily influenced by market forces. Thus, the practice of small scale

fishers, as well as their cultural perceptions on conservation issues, are oftentimes constructed by forces fitting into their logic of production and reproduction of daily life. It is this logic and cultural construction that tend to influence their decisions related to what technology to use and the fishing grounds to exploit. This paper explores the many instances in which the fishermen of La Parguera express through their discourses and practices about production and the importance of conservation practices. This paper also takes a critical look at the actual conservation practices and those circumstances that prevent full sustainability on their behalf. Perhaps, the most crucial event related to conservation is the action movement towards the development of a Marine Fishery Reserve (MFR). This can also be seen in the way they chose a reef to be designated a MFR. Because the chosen area was perceived by the fishermen of La Parguera as the least productive in terms of quantity of fish, it was seen as the "perfect" place for the establishment of the marine reserve so it can be "saved" for future use

**Segerer, G.** (1997). L'origine des Bijogo: Hypothèses de linguiste: Communication à l'ille.Paris: CNRS-LLACAN.

**Barry, W. J., & Foster, J. W.** (1998). California underwater parks and reserves planning and management. *In:* O. Magoon, H. Converse, B. Baird, & M. Miller-Henson (eds), Taking a Look at California's Ocean Resources: An Agenda for the Future Vol. 1 (pp. 86-97). Reston, VA-USA: ASCE.

**Abstract:** Gaps in the underwater component of the California state park system are evident in several regions of the state. To assess deficiencies in biological diversity we have divided the state into "ecological regions". Ecological regions are the basis for natural heritage planning of the state park system (Sec. 5019.53 of the California Public Resources Code). The marine ecological regions are the focus of this plan; however terrestrial ecological regions are utilized for non-marine underwater analysis. Offshore cultural heritage features include both prehistoric sites and artifacts as well as historical features such as shipwrecks. Many coastal archeological sites were inundated as the sea level rose after the last ice age. However very few of these sites have been identified due to the difficulties in relocation. Recreational features often relate to areas of high natural diversity as these areas tend to be most attractive. Shipwreck sites are also popular with divers. Safe diving access is an issue to be addressed in this plan; facility development for skin and SCUBA divers is also important to the diving public. Interpretation of cultural and natural features is important to achieving the missions of the Department. Interpretation is an important product of research; as it informs the public of their California heritage

**Brailovskaya, T.** (1998). Obstacles to Protecting Marine Biodiversity through Marine Wilderness Preservation: Examples from the New England Region. *In:* Conservation Biology, 12(6), 1236-1240.

**Abstract:** The amount of terrestrial protection achieved for biodiversity through designation of no-take public wilderness areas in the United States is much greater than no-take protection in the nation's National Marine Sanctuary System. With the exception of a small area in the Florida Keys, no permanent reserve in the United States protects marine biodiversity from commercial fishing with gear that has strong effects on marine habitats and which has been identified as one of the major threats to marine biodiversity. A recent national poll has shown that public support does exist for conservation of the marine environment and protection of marine biodiversity. The New England region provides examples of the obstacles that such support may face in regions with a long history of commercial exploitation of marine species. I discuss the overall influence that the commercial fishing industry in New England has had on marine conservation efforts in the region, contrast the public's perception of marine versus terrestrial wildlife species, and describe the nature of the media's coverage of the commercial

fishing industry and fisheries management issues in the region. I propose the creation of a national no-take marine wilderness preservation system as a way to achieve protection of marine biodiversity as a separate goal from sustainable fisheries management in New England and other, similar regions in the United States

**Cassano, E. R.** (1998). International recognition and protection for United States National Marine Sanctuaries. *In: O. Magoon, H. Converse, B. Baird, & M. Miller-Henson (eds), Taking a Look at California's Ocean Resources: An Agenda for the Future Vol. 1 (p. 98). Reston, VA-USA: ASCE.*

**Abstract:** The United States National Marine Sanctuary Program (Marine Sanctuary Program) was mandated under Title III of the Marine Protection, Research and Sanctuaries Act (MPSRA) of 1972 as amended. The Marine Sanctuary Program was created to identify and manage areas of the marine environment that "posses conservation, recreational, ecological, historical, research and esthetic qualities which give them national and in some instances international significance". The size and scope of many of the designated United States Marine Sanctuaries include ocean areas that cross several jurisdictional zones. The Marine Sanctuary Program recognizes that maritime activities, in the form of vessel traffic constitute one of the major threats to sanctuary resources. This threat is in the form of marine pollution from vessels as, either operational or accidental discharge of pollutants, or physical groundings. This paper describes the existing national and international legal framework that limits the United States ability to fully protect the resources of a sanctuary in the Territorial Sea and the Exclusive Economic Zone (EEZ). The MPSRA is examined to see how sanctuary regulations may be implemented to protect resources by monitoring and controlling foreign vessel movement and discharges

**Cuthill, M.** (1998). Managing the Yongala Historic Shipwreck. *In: Coastal Management, 26(1), 33-46.*

**Abstract:** The Yongala Historic Shipwreck lies within the Great Barrier Reef Marine Park in northeastern Australia. A draft management plan, produced by the Queensland Museum in 1992, provided primarily for the management of the historical and archaeological values of the wreck. The plan did not outline comprehensive strategies for management of either the special ecological values of the site or an increasing demand by recreational divers to dive the wreck. This article outlines the processes involved in integrating management of the social, ecological, and historical values of the wreck into a format that is acceptable to all stakeholders associated with the site

**Daves, N. K., & Nammack, M.** (1998). US and International mechanisms for protecting and managing shark resources. *In: Fisheries Research, 39(2), 223-228.*

**Abstract:** Sharks have become a popular target for fisheries throughout the world. The presence of profitable markets for shark products, combined with the dwindling status of the more traditional target species such as cod and haddock, have led to the over-exploitation of some shark species. Due to their k-selected life history patterns (long-lived, slow-growing animals with a very limited reproductive potential), many shark species are particularly vulnerable to over-exploitation. Some species are likely to be in need of protection. Two possible ways in which sharks could be protected, in addition to traditional harvest management methods are, globally, through the Convention on International Trade in Endangered Species (CITES) or, in the United States, through the Endangered Species Act (ESA). As a result of the United States' recommendation that the international trade in sharks be discussed at the Ninth Conference of the Parties to the CITES in November 1994, a resolution was adopted to review information on the biological status of sharks and the impacts of international trade. More work was done on the resolution at the Tenth Conference of the Parties in June 1997 and is on-

going. The ESA provides protection for species that are listed as threatened or endangered. The two agencies administering the ESA must use the best available scientific and commercial data to determine whether a species warrants protection under the ESA. There are currently no international regional regimes for the management of sharks; however, their formation should be investigated by countries and intergovernmental organizations.

**De Vogelaere, A., & Green, R. C.** (1998). A review of research programs in central California coastal managed areas with a suggestion for improved collaboration. *In*: O. Magoon, H. Converse, B. Baird, & M. Miller-Henson (eds), Taking a Look at California's Ocean Resources: An Agenda for the Future Vol. 1 (pp. 99-104). Reston, VA-USA: ASCE.

**Abstract:** Between Pt. Reyes, located north of San Francisco, and Cambria, at the southern end of the Big Sur coast, there are over 30 managed coastal areas. These areas are designated as sanctuaries, reserves, preserves, refuges, wildlife areas, and parks. A review of these coastal programs found they have similar goals and overlapping jurisdictions. However, programs that incorporated scientific advisory groups had more current management plans, a broader view of resource management alternatives, larger research budgets, and a wider variety of research activities. These programs were developed, in large part, independently of each other and based on local history more than a comprehensive resource management vision. There is great opportunity for collaboration between these programs to improve their individual and common goals. The Monterey Bay National Marine Sanctuary (MBNMS), encompassing most of the coastline in central California, has a programmatic structure of working groups and advisory councils that take advantage of insight from academic scientists, multiple resource management agencies, user group representatives, and education specialists. The MBNMS may be the forum for improved collaboration between programs and an avenue to academic scientists in the development of science plans and enacting necessary research

**Edwards, M. S.** (1998). Effects of long-term kelp canopy exclusion on the abundance of the annual alga *Desmarestia ligulata* (Light F) . *In*: Journal of Experimental Marine Biology and Ecology, 228(2), 309-326.

**Abstract:** Experiments in a central California *Macrocystis pyrifera* (L.) C.A. Agardh forest examined the effects of long-term (six year) kelp canopy exclusion on the abundance of the annual brown alga *Desmarestia ligulata* (Light F). Exclusion of both surface and subsurface kelp canopies from replicate clearings within Stillwater Cove, CA, USA showed that *D. ligulata* sporophyte recruitment is opportunistic, with more sporophytes occurring in areas where canopies were excluded than under control canopies. Kelp canopy exclusion also increased spring and summer bottom irradiances, and resulted in a steady increase of perennial turf algae over the six-year study. This, in turn, led to a decrease in the availability of nongeniculate coralline algae (the primary substratum on which *D. ligulata* recruits). Subsequently, the annual maximum abundance of *D. ligulata* sporophytes decreased in the canopy clearings, but did not change under control canopies. Removal of turf algae from experimental plots further increased bottom irradiances and significantly enhanced *D. ligulata* recruitment. When released from apparent competition for light and space, *D. ligulata* sporophytes exhibited an annual life history, with recruitment occurring during a two-week period (April 4<sup>th</sup> - April 17<sup>th</sup>) in the spring, and maximum bottom cover occurring in the summer (July). The onset of *Desmarestia* sporophyte recruitment was closely associated with seasonal increases in daylength and rapid decreases in ocean temperature. These results indicate that the *Desmarestia* sporophyte life history is both annual and opportunistic, with the onset of recruitment stimulated by predictable, seasonal changes in environmental conditions, and the magnitude of recruitment modified by stochastic processes that affect the availability of light and space. Comparison of these results with those from similar studies indicate that they are robust and suggest that they may be generalized over broad temporal and spatial scales.

**Gabrie, C., & Moyne-Picard, M.** (1998). L'Etat des Récifs Coralliens en France Outre-Mer: Nouvelle Calédonie, Wallis et Futuna, Polynésie Française, Clipperton, Guadeloupe, Martinique, Mayotte, La Réunion, Iles Eparses de l'Océan Indien. (p. 136). Paris-France: Ministère de l' Aménagement du Territoire et de l' Environnement.

Notes: This book exists as an english translation 37 pp.

**Abstract:** The International Coral Reef Initiative (ICRI) is a partnership among nations and organisations to mobilise government and stakeholder support for vigorous and effective actions to address threats to the worlds coral reef ecosystems, by promoting their protection and sustainable development. This document on the state of coral reefs in the French Overseas Departments and Territories (DOM-TOM) was drawn up as part of French undertakings as a member of the ICRI, on request from the French Ministry of Spatial Planning and Environment and with the support of the Secretariat for Overseas Affairs and the French Institute of the Environment (IFEN). Overseas Departments and Territories are located in three of the worlds oceans. Their geographical distribution account for the wide variety of coral reef types, and hence their outstanding natural diversity. Cultural, historical, political and administrative differences between the DOM-TOM have also given rise to a range of different management tools and methods. This brochure is the executive summary of a larger document containing a chapter on each of the DOM-TOM, to be published in English and French. The document was commissioned from C. GABRIE (Consultant in Tropical Marine and Coastal Environments) as a preliminary and as yet incomplete assessment of the state of DOM-TOM coral reefs. The assessment was made in collaboration with a large number of managers and researchers. The resulting document is intended as an aid for policy-makers, by describing the specific features of the various coral reefs and explaining why they need ta be preserved, and also for scientists, by outlining the management and conservation tools available at national and international level. The document describes the current state of coral reefs, their importance, the pressures being exerted on those ecosystems and the responses mode by the various parties involved ( types of coral reefs: fringing reefs, barrier reefs, atolls, platform reef, heritage value and social and economic importance, species diversity, consequences of coral reef damage, causes of coral reef degradation: natural pressures with global change, cyclones, coral bleaching, Acanthaster infestations, coral diseases, human pressures (land management, mining, agriculture and sediment run-off, water pollution, aggregate extraction and dredging, coastal reclamation, exploitation of biological resources, potentially harmful fishing methods) responses to the problems with the relevant organisations, regional arrangements, legislation and regulations, international conventions, land use management and planning, planning and management tools (integrated coastal aree management, water management, local environment charter, management of biological resources), conservation measures (marine protected areas, ZNIEFF areas, RAMSAR sites, Biosphere Reserves, Coastal and Lakeshore Conservation Agency CRLRL), coral reefs and development policy, monitoring networks (Worldwide Coral Reef Monitoring: Global Coral Reef Monitoring Network GCRMN, Reef Check...), research, sources of funding European funding, private funding

**Karczmarski, L. et al.** (1998). Recommendations for the conservation and management of humpback dolphins *Sousa chinensis* in the Algoa Bay region, South Africa. *In: Koedoe*, 41(2), 121-129.

**Abstract:** The natural history of humpback dolphins *Sousa chinensis* inhabiting the Algoa Bay region, Eastern Cape, South Africa, was investigated by means of land- and sea-based surveys undertaken between May 1991 and May 1994. This article reviews the findings which are relevant to the conservation of humpback dolphins and provides recommendations for both the conservation and management of this species in Eastern Cape waters. In general, humpback dolphins appear to be typical coastal dolphins which occur in small numbers, have low population growth and depend on restricted inshore resources. Establishment of protected areas

where human impact could be limited or controlled seems to be the most effective conservation management approach. Habitats critical for humpback dolphins in Eastern Cape waters (inshore rocky reefs) and the dolphin's core areas in the Algoa Bay region have been identified. It is recommended that a conservation and management zone (marine sanctuary) in the Algoa Bay region be established and a suitable site for it is identified. Given adequate legislation and proper management, this area could be used for the development of ecotourism, including dolphin-watch operations, which would further stimulate interest in coastal conservation

**Kauffman, K. S.** (1998). The California coast: Of, by and for the people. *In:* O. Magoon, H. Converse, B. Baird, & M. Miller-Henson (eds), Taking a Look at California's Ocean Resources: An Agenda for the Future Vol. 2 (p. 1146). Reston: ASCE.

**Abstract:** In order to adequately protect our marine resources in California it is essential to continue to involve the public. Governmental and educational institutions cannot do that job alone, nor are there sufficient funds available in the public sector. Recognizing the wealth and variety of California's coastal and ocean resources, the complicated interplay of political jurisdictions, and the high expectations on the part of the public, this is our challenge: We must find ways to mobilize and utilize coastal advocates more effectively. We must be ready to channel energies and enthusiasm. We must develop formal structures to plug in willing volunteers and recruit more. Some existing role models which already provide such structure are the Sanctuary Advisory Council of the Monterey Bay National Marine Sanctuary, the Big Sur Multi-Agency Advisory Council and the Monterey Bay Sanctuary's Water Quality Protection Program. Each serves as an example of integrated management and inter-agency coordination on a variety of governmental levels. Each insists on public involvement and a network of organizational and agency support. Each has a history of successes and recognized achievements. Utilizing California's unique coastal and ocean resources - which include its people - we have the potential to provide global leadership in designing more productive patterns of governance

**Lindholm, J. et al.** (1998). Post-settlement Survivorship of Juvenile Atlantic Cod and the Design of Marine Protected Areas. *In:* E. M. Dorsey, & J. Pederson (eds), Effects of Fishing Gear on the Sea Floor of New England [Ashland, MA (USA), 30 May 1997] (pp. 123-128). Summer Street: Conservation Law Foundation.

**Abstract:** This paper describes one component of an ongoing research effort to assess the effects of fishing on habitat and the role of marine protected areas (MPAs) as tools for conservation and management. The purpose of this study is to formulate a model that describes post-settlement survivorship of juveniles as one of the critical components in the life history of demersal fish. Here we use the model to investigate the importance of sea floor habitat in fish survivorship. First, we review the life history of a demersal fish, Atlantic cod (*Gadus morhua*). Cod eggs are released into the water column by spawning females and are subsequently fertilized. The eggs remain in the water column during development, eventually hatching into pelagic larvae which, in turn, metamorphose into pelagic juveniles. Roughly four months after spawning, the pelagic juveniles settle to the sea floor and transition to demersal juveniles. Historically, most scientific research has been dedicated to pelagic processes, such as predation on the various pelagic stages, in an attempt to explain annual fluctuations in fish populations (for example, see Anderson 1988)

**McArdle, D. A.** (1998). The status of California marine protected areas. *In:* O. Magoon, H. Converse, B. Baird, & M. Miller-Henson (eds), Taking a Look at California's Ocean Resources: An Agenda for the Future. California and the World Ocean '97, San Diego, CA (USA), 24-27 Mar 1997, Chap. 1, (pp. 74-85). Reston: ASCE.

**Abstract:** In California there are 104 Marine Protected Areas (MPAs) that have been

historically designated on a case by case basis causing information about them to be confusing and complex. This process has resulted in many MPAs being managed in isolation and not as a component of the statewide MPA system of which they are a part. MPAs in California are also listed under numerous classifications ranging from small highly protected reserves to larger multiple use sanctuaries. The objective of this project was to create a database that will provide researchers, resource managers, and resource users with comprehensive and centralized information on California MPAs. The database includes information on MPA classification type, county, geographic region, date established, responsible agencies, fishing-related regulations, official regulations and official boundaries. A publication entitled, "California Marine Protected Areas" has also been published and includes the aforementioned information as well as a series of maps showing each MPA location, area and an MPA contact list. This database has been compiled to assist in the improvement of the methods of MPA site selection and to help to begin to integrate existing MPAs into a statewide system.

**Murray, S. N.** (1998). Effectiveness of marine life refuges on southern California shores. *In*: O. Magoon, H. Converse, B. Baird, & M. Miller-Henson (eds), Taking a Look at California's Ocean Resources: An Agenda for the Future Vol. 2 (pp. 1453-1465). Reston: ASCE.

**Abstract:** California's valuable coastal resources are used intensely for educational, scientific, commercial, and recreational purposes. Because of the intensity of this utilization, rocky intertidal systems throughout the State are being impacted by human activities, including the pulse disturbances of lawful and unlawful harvesting and the damaging effects of visitor foot traffic and human manipulation of organisms and substrata. In California and elsewhere, Marine Protected Areas (MPAs) serve as a primary tool for protecting and sustaining intertidal ecosystems. Throughout much of urban southern California, California Marine Life Refuges (CMLRs) are the principal form of MPA designed to protect intertidal organisms. However, CMLRs allow recreational fishing and, while placing restrictions on the collecting of most species of invertebrates and seaweeds, do not limit visitor access. In a year-long study of eight sites in Orange County, California, four of which have been designated CMLRs since 1968-71, unlawful collecting was observed to be of widespread and frequent occurrence both in and outside historical CMLR boundaries. Human visitation is often extreme on southern California rocky shores and visitor foot traffic is known to damage intertidal organisms. Results of an ongoing experimental study reveal that the canopy-forming rockweed *Pelvetia compressa* suffers substantial damage from trampling, including the loss of large amounts of potential reproductive material. It is concluded that CMLRs, as currently designed and patrolled, are ineffective in protecting coastal populations in regions of high visitor density. Knowledge of the current status of coastal ecosystems and the processes that affect them should be used to evaluate California's MPA system with the goal of designing truly effective refuges and sanctuaries for sustaining coastal populations

**Noble, R. A., & Henk Jr., F. H.** (1998). Hydrocarbon charge of a bacterial gas field by prolonged methanogenesis: an example from the East Java Sea, Indonesia. *In*: Organic Geochemistry, 29(1-3), 301-314.

**Abstract:** The Terang-Sirasun Field in the East Java Sea of Indonesia contains 1.0 trillion cubic feet (TCF) of dry gas reserves, which are made up of over 99.5% methane with  $[\delta^{13}C]$  of -65[permil] and  $[\delta^{15}D]$  of -185[permil]. The methane was formed exclusively by methanogenic bacteria via the CO<sub>2</sub> reduction pathway. The primary source sediments for the methane were identified based on bulk geochemical and absolute biomarker concentrations. Specifically, the C<sub>25</sub> acyclic isoprenoid 2,6,10,15,19-pentamethyleicosane (PME), and related isoprenyl glyceryl ethers, which are well known markers for methanogenic archaeobacteria, were used as indicators for sediment layers thought to have had the most abundant methanogen activity. Burial history analysis and precise biostratigraphic age control provided the framework

for assessing the timing of hydrocarbon fill. Our findings show that methanogenic activity was highest in marine shelfal claystones (mid-outer neritic) ranging in age from 8 Ma (Late Miocene) to present. The gas is reservoirized in limestones and sands of the Paciran Member, which are dated from 6.5 to 1.3 Ma (Late Miocene-Pliocene). The top seal for the present accumulation was deposited less than 0.5 Ma ago (Quaternary), although there is strong geological evidence that older seals existed. These older seals were catastrophically removed by submarine slumping resulting in the loss of earlier accumulated gas. Methanogenesis from older source beds continued, and the trap was recharged after deposition of the current top seal. The information obtained from this field study provides evidence that large accumulations of bacterial methane do not necessarily require early entrapment of methane from freshly deposited marine sediments. Traps may be filled with bacterial gas long after the deposition of source beds, provided that the required conditions for active methanogenesis are maintained throughout this period

**Phillips, A.** (1998). Marine conservation initiatives in Australia: Their relevance to the conservation of macroalgae. *In: Botanica Marina*, 41(1), 95-103 .

**Abstract:** The world's oceans have been widely regarded as the source of inexhaustible abundance and the need to conserve the Earth's largest biotic realm has only recently been recognised. Consequently, studies of marine conservation have lagged behind comparable studies of terrestrial biomes. Compiling inventories, monitoring ecological communities, detecting and monitoring rare and threatened species, devising biogeographic classification schemes, declaring protected areas (reserves) and reporting to government on the state of the environment are strategies thought effective for the conservation of biodiversity. There is no comprehensive inventory of Australian marine macroalgae, although 'The Australian Marine Algal Name Index' stores data on species names and species distribution patterns for the continent. No Australian marine macroalgal species is currently included on any 'Rare and Threatened' species list, but this reflects only our inability to detect these species. Biogeographic classification schemes have been devised for Australian coastal waters, but little is known of the macroalgae in many of the bio-regions identified. Many marine protected areas (MPAs) have been declared in Australia, but the macroalgae protected in the reserves are generally poorly known and the effects of protection on macroalgal biodiversity has not been evaluated. Furthermore, many MPAs are zoned as multi-use areas, and the actual areas of MPAs zoned as 'conservation zone', offering strict protection, are very small. The greatest impediment to developing effective strategies for the conservation of Australian marine macroalgae is the lack of detailed knowledge on taxonomy, population size, life history characteristics, habitat specificity and geographic distribution of species and on the structure and function of macroalgal communities. In order to gain this knowledge, priority should be given to research programs directly relevant to the inventorying, monitoring, protection and management of marine macroalgal biodiversity. It is essential that conservation and management of the marine environment are based on scientific knowledge

**Pomeroy, C., & Beck, J.** (1998). Cooperative management of the state's marine ecological reserves: Preliminary evidence from Big Creek. *In: O. Magoon, H. Converse, B. Baird, & M. Miller-Henson (eds), Taking a Look at California's Ocean Resources: An Agenda for the Future. vol. 1* (pp. 105-116). Reston: ASCE.

**Abstract:** The passage of Proposition 132 in 1990 banned the use of gillnets in California's nearshore areas, and mandated the establishment of four Marine Ecological Reserves (MERs) along the state's coast. To determine the MERs' effectiveness in protecting and enhancing fishery resources - their stated goal - it is essential to allocate resources and develop mechanisms for monitoring them over time. This, however, requires financial and personnel resources that may or may not be readily available from the state. An alternative or complement

lies in the possibility of involving local fishermen in the collection of data and other, related management tasks. Big Creek Ecological Reserve, is unique among the four MERs in that such a system of cooperative management had emerged well before its formal establishment. Since 1991, the manager of the adjacent terrestrial reserve and local fishermen have mapped and systematically collected data on rockfish catches at sites near the marine reserve in an attempt to monitor the effects of local fishing on the MER and vice versa. We explore the Big Creek arrangement, its history and evolution, as well as current efforts to refine and enhance the system so that it may better serve research and management needs. We discuss the cooperative arrangement in connection with its benefits for both local fishers and managers including 1) the provision of low cost, high quality fishery-dependent data to complement fishery-independent data for the evaluation of the relationship between the MER and local fisheries, and 2) the maintenance of ongoing communication among local fishermen, researchers and managers. Taken together, these elements may enhance the effectiveness of the MER

**Roettingen, I., & Slotte, A.** (1998). Norwegian spring spawning herring (*Clupea harengus* L.): Protection of spawning areas in relation to changes in migration pattern. (p. 13). Copenhagen Denmark: ICES.

**Abstract:** The main spawning and fishing areas for the Norwegian spring spawning herring (*Clupea harengus*) during the last century and the first half of the present century were located south of 60 degree N. From the late 1940s changes in the migration patterns of the herring led to a northward shift in the location of spawning activities, and by the beginning of the 1960s the spawning occurred only in areas located north of 62 degree N. Further, in the late 1960s this stock was depleted due to a large increase in fishing effort on all life stages of the herring. At the start of the rebuilding period the spawning occurred north of 62 degree N. However, in 1989, after an absence of 30 years, the herring began spawning in the historically important areas south of 60 degree N. A fishing ban was introduced in these areas, and this paper evaluate this spawning habitat protection with regard to a rebuilding of the stock and ecosystem development.

**Ruddle, K.** (1998). The context of policy design for existing community-based fisheries management systems in the Pacific Islands. *In: Ocean & Coastal Management*, 40(2-3), 105-126.

**Abstract:** Community-based fisheries management is being widely promoted as an alternative to centralized systems based on the familiar bioeconomic models that have manifestly failed to prevent a near catastrophic overexploitation of fish stocks worldwide. The Pacific Island Region probably contains the world's greatest concentration of still-functioning traditional community-based systems for managing coastal-marine fisheries and other resources. It has been frequently asserted that many such traditional systems provide both a firm foundation for future coastal fisheries management in the Pacific Islands Region, as well as a conceptual framework for managing fisheries elsewhere. Although now seemingly self-evident to fisheries development "experts", such assertions remain largely unverified. Whereas it is a relatively straightforward task to distil basic "design principles" from a sample of systems, it is far more complex to analyze the multi-sectoral national environment in which they function, especially when their history is taken into account. In other words, it is far less widely appreciated that many contemporary community-based fisheries management systems are the end products of a long process of change and adaptation to external pressures and constraints. In this article I address some of the broader contextual issues that should be appreciated in policymaking with respect to a potential modern role for traditional management systems in general, and in the analysis of a future role for any given system. First, the principal external factors that have caused change in systems are described and exemplified. The recognition of the potential role of existing community-based fisheries systems, and attempts to act on it, is summarized for

some Pacific Island nations, with a focus on the complex problem of reconciling customary and statutory legal systems. In the final section I examine three principal national policy alternatives regarding the potential role of existing local fisheries management systems, together with three main criteria for determining whether or not a system can be adapted to fulfill modern requirements.

**Russ, G., & Alcala, A. C.** (1998). Natural fishing experiments in marine reserves 1983-1993: roles of life history and fishing intensity in family responses. *In: Coral Reefs*, 17(4), 399-416.  
**Abstract:** This study examined the effect of fishing on the abundance and species richness of families of coral reef fish at two islands (Sumilon and Apo) in the Philippines from 1983 to 1993. Natural fishing experiments occurred in marine reserves at each island, where long term estimates of fishing intensity were available. Responses to fishing were interpreted in terms of life histories of fish. The intensity of fishing and fish life histories were generally good predictors of the differential rates of decline and recovery of abundance in response to fishing. Large predators had vulnerable life histories (low rates of natural mortality, growth and recruitment) and were subjected to high intensity fishing. They declined significantly in density when fished and increased significantly but slowly when protected from fishing. Caesionidae, a family with a life history resilient to fishing (high rates of natural mortality, growth and recruitment) but fished intensively also declined rapidly in abundance when fished. Thus, knowledge of life history alone was insufficient to predict response to fishing. Acanthuridae were fished relatively hard and had a life history of intermediate vulnerability but displayed weak responses to fishing. Thus level of fishing intensity alone was also not sufficient to predict response to fishing. For Chaetodontidae, effects of fishing conformed to expectations based on life history and fishing intensity at one island but not the other. Three families with intermediate vulnerability and subjected to intermediate to light fishing (F. Scaridae, Labridae and Mullidae) displayed predictably weak responses to fishing, or counter-intuitive responses (e.g., increasing in abundance following fishing). These counter-intuitive responses were unlikely to be secondary effects of increase in prey in response to declines of predators. Two lightly-fished families with resilient life histories (F. Pomacentridae, Sub F. Anthiinae) predictably displayed weak numerical responses to fishing except during a period of use of explosives and drive nets

**Scheiber, H. N.** (1998). Historical memory, cultural claims, and environmental ethics in the jurisprudence of whaling regulation. *In: Ocean & Coastal Management*, 38(1), 5-40.  
**Abstract:** This study considers in historical perspective the ethical and juridical norms relevant to commercial and indigenous whaling activities and their regulation. An assessment is offered of the records of the International Whaling Commission from 1946 to the present, and of individual whaling nations, especially Japan and Norway. The argument is made that historic behavior should matter, when the question is raised: What nations or interests come to the table with "clean hands"? The author rejects arguments by Japan, Norway, and various scholars that coastal whaling communities in industrialized countries should be regarded as equivalent to indigenous whaling communities such as the Inuit in justifying exceptions to the IWC moratorium. In light of whale species' precarious condition and in light of past behavior by whaling fleets, only strongly based indigenous cultural claims should be permitted to trump a general rule against whaling.

**Thiobane, M.** (1998). Observation et gestion durable des sites historiques et archéologiques des amas coquilliers du delta du Saloum Sénégal). Université Cheikh Anta Diop, Dakar.

**UNESCO.** (1998). Médecine et Sagesse. (p. 50). [s. l.]: [s. n.].

**VenTresca, D. A. et al.** (1998). The potential of marine reserves to enhance fisheries. *In: O. Magoon, H. Converse, B. Baird, & M. Miller-Henson (eds), Taking a Look at California's Ocean Resources: An Agenda for the Future. vol. 1* (p. 856). Reston: ASCE.

**Abstract:** Rockfishes (*Sebastes* spp.) are an important and heavily exploited component of sport and commercial fisheries in central California. The success and quality of central California's nearshore rockfish sport fisheries have declined over the past decades, particularly in areas close to ports. Recognizing that a change in the current resource management approach is warranted, alternative management and enhancement strategies are of paramount importance. Our project, the Central California Marine Sport Fish Survey, has monitored nearshore recreational fisheries and documented life history characteristics of many rockfish species since 1956. Marine reserves have been reported to enhance fisheries in other parts of the nation and world, but limited information is available to evaluate their effectiveness relative to California's sport and commercial rockfish fisheries. The establishment of the Big Creek Ecological Reserve (BCER), approximately 50 miles south of Monterey, California, presents a unique opportunity to evaluate the effects of a reserve on the rockfish resource. Obtaining baseline information on species composition, densities, and length frequencies of rockfish populations within and adjacent to BCER is the crucial first step for determining change in population parameters and future benefits to adjacent and distant fisheries. This information will allow resource managers to evaluate marine reserves as an alternative management tool for rockfish populations. Present population parameters of selected fish populations in nearshore habitats within and adjacent to BCER have been assessed visually (densities) by scuba divers and recorded with an underwater video camera equipped with paired lasers (length frequencies) during permanent and random transects

[Anon.]. (1999). Actes du colloque international sur le mouvement almoravide. Nouakchott, 14 - 17 avril 1996. *In: Cahier Des Sources De L'Histoire De La Mauritanie*, (cahier n° 2), 155 .

**Borrego, J. et al.** (1999). The holocene transgression into the estuarine central basin of the Odiel River mouth (Cadig gulf, SW, Spain): lithology and faunal assemblages. *In: Quaternary Science Reviews*, 18(6), 769-788.

**Abstract:** Six estuarine facies were distinguished recording the Holocene history of sea level rise relating according to the start and development of the Holocene transgression which flooded the coast of Huelva: Facies 2 (gravels), Facies 3 (grey clayey silts), Facies 5 (well sorted sands), Facies 4 (silty sands), Facies 5 (black clayey silts), and Facies 6 (red muds). This group overlies Neogene sediments (Facies 1). Three faunal assemblages (Open bay (OB), Central estuary (CE), and Wave domination (WD)) including remains of macrofauna, foraminifers and ostracods plus depositional features, are identified in a sedimentological log constructed from a borehole with a continuous core, sunk in the central basin of the Odiel River estuary, Huelva coast, SW. Spain. The OB assemblage requires shallow and protected zones controlled by low energy tidal currents; the CE assemblage is located within an intertidal zone, where reworked marine forms of foraminifers, ostracods and scattered macrofauna co-exist with small estuarine foraminifers and ostracods; the WD assemblage comprises tests of marine macrofauna with fractured shells plus large marine foraminifers and estuarine ostracods. During the first stage of continuous sea level rise (8720+-260&nbsp;BP to 5390+-155&nbsp;BP), estuarine accretion, high energy tidal currents and wave action took place successively, allowing the development of the OB, CE and WD assemblages. The second stage (5390+-155&nbsp;BP to Present), with a stabilized sea level, comprised a vertical decrease of energy, with tidal currents favouring deposition in shallow tidal channels and marsh zones, leading to less energetic CE assemblages within the estuarine central basin. High sediment supply resulted in deposition during this stage, which shows a regressive nature

**Burlington, L. B.** (1999). Ten Year Historical Perspective of the NOAA Damage Assessment and Restoration Program. *In: Spill Science & Technology Bulletin*, 5(2), 109-116.

**Abstract:** The United States Oil Pollution Act of 1990 (OPA) was enacted to reduce the probability of oil spills in U.S. waters. A key provision of the legislation enables recovery of damages for restoration of injured natural resources and lost services due to oil spills. The National Oceanic and Atmospheric Administration (NOAA) developed regulations that set out a process for determining the appropriate type and scale of restoration actions to accomplish this goal. The restoration plan developed through this process is the basis for an economic claim for natural resource damages. The regulations recognize that various methods, including environmental models, may be used in identifying and quantifying injuries to natural resources and losses of their services and in developing a restoration approach for these injuries. Rather than designating particular assessment measures, NOAA requires each trustee to decide which methodologies are appropriate for each incident, given its particular facts and circumstances. Any procedure chosen must meet the standards in the rule: it must provide information useful for determining restoration needed for an incident, the cost of the method must be commensurate with the quality and quantity of information it is expected to generate, and, of particular significance here, the method must be reliable and valid for the particular incident. This paper describes how methods are selected, how they might be used, and what legal standards would be applied should these methods be used as evidence in litigation.

**Le Loeuff, P.** (1999). La macrofaune d'invertébrés benthiques des écosystèmes à salinité variable le long des côtes atlantiques de l'Afrique tropicale; variations de la biodiversité en relation avec les conditions climatiques actuelles (précipitations) et l'histoire climatique régionale. *In: Zoosystema*, 21(3), 557-571.

**Abstract:** The West African marginolittoral benthic fauna biodiversity, defined from an exhaustive bibliographical study, is lower in arid (Mauritania, Angola) or subarid climates (Senegambia, from Ghana to Benin) and higher in humid regions (from Guinea-Bissau to Liberia and from Nigeria to Gabon) or in regions with large rivers (Ivory Coast, Congo). Under arid and dry climates, periodical severe conditions (high salinity, anoxia...), dramatically increased during the 1970-1980 decades, are not favourable to the settlement of species and communities, despite the remarkable adaptive response of some species like the bivalve *Senilia senilis* on the Banc d'Arguin (Mauritania). This situation is also the consequence of Quaternary palaeoclimatic events; during the driest periods, species may have survived in refuges found on the still humid climate coasts, from Guinea to Ivory Coast and from Nigeria to Congo.

**Leach, M., Mearns, R., & Scoones, I.** (1999). Environmental Entitlements: Dynamics and Institutions in Community-Based Natural Resource Management. *In: World Development*, 27(2), 225-247.

**Abstract:** While community-based natural resource management (CBNRM) now attracts widespread international attention, its practical implementation frequently falls short of expectations. This paper contributes to emerging critiques by focusing on the implications of intracommunity dynamics and ecological heterogeneity. It builds a conceptual framework highlighting the central role of institutions -- regularized patterns of behavior between individuals and groups in society -- in mediating environment-society relationships. Grounded in an extended form of entitlements analysis, the framework explores how differently positioned social actors command environmental goods and services that are instrumental to their well-being. Further insights are drawn from analyses of social difference; "new", dynamic ecology; new institutional economics; structuration theory, and landscape history. The theoretical argument is illustrated with case material from India, South Africa and Ghana.

**Lindholm, J.** (1999). Habitat-mediated Survivorship of Juvenile Atlantic Cod (*Gadus morhua*): Fish Population Responses To Fishing-induced Alteration of the Seafloor in the Northwest Atlantic and Implications for the Design of Marine Protected Areas. In: Diss. Abst. Int., 59, Pt B Sci. and Eng.(12), 6168 .

**Abstract:** Much scientific research has focused on large- scale planktonic egg and larval mortality as a factor contributing to annual fluctuations in year-class strength of fishes. Significantly less attention has focused on small-scale, localized processes affecting survivorship of early benthic- phase juvenile fish, although mortality during this life history stage is sufficient to significantly modify population size. The sustainability of Atlantic cod (*Gadus morhua*) populations, a species with ecological, economic and cultural significance for New England, is dependent on the continued productivity of off- shore nursery grounds currently at risk from alteration by fishing activity. Key questions in this regard are: (1) the role of seafloor habitat in mediating the survivorship of early benthic- phase cod; and (2) the implications of predator- prey-habitat interactions for the design and allocation of marine protected areas (MPAs) for fish conservation and management in the northwest Atlantic. Laboratory experiments quantify the effect of fishing impacts to seafloor habitat on mortality rates for juvenile cod. Results indicate that the presence of emergent epifauna (habitat undisturbed by fishing) resulted in a significant decrease in juvenile cod mortality when compared to flat sand (habitat disturbed by fishing) and that density of emergent epifauna is more significant than epifaunal height in reducing juvenile cod mortality. a computer model, parameterized with lab-derived mortality rates and spatial variation in habitat type from seafloor mapping, captures non-linearities in the responses of fish populations to seafloor habitat alteration given variations in fish movement rates, fish densities and MPA size. Comparison of the existing National Marine Sanctuaries to the National Parks, Forests and Wildlife Refuges illuminates a significant disparity in the designation of protected areas between marine and terrestrial systems with respect to the size of protected areas, their number, and the total area and the proportion of U.S. land and waters currently under protection. Primary conclusions include: (1) fishing alteration of the seafloor has a significant deleterious impact on associated Atlantic cod populations; (2) there is a need to incorporate seafloor habitat protection in the designation of MPAs for fish management; and (3) habitat-specific MPAs should be designated in the northwest Atlantic to buffer against environmental and managerial uncertainty

**Malcolm, H. A., Cheal, A., & Thompson, A.** (1999). Fishes of the Yongala historic shipwreck. (p. 29). Townsville (Australia): Cooperative Research Cent. for the Ecologically Sustainable Development of the Great Barrier Reef.

**Abstract:** The wreck of the S.S. Yongala is regarded as one of the top ten dive sites of the world, not only because of the size, structural integrity and proximity to Townsville, Queensland (Australia) but also because of the uniqueness of the fish community that makes the Yongala historic shipwreck its home base. The sheer abundance, variety and large size of predators (especially snapper, cod and trevally) is extraordinary on the Great Barrier Reef. The attachment of fish to the wreck has been shown by documenting the stability of fish numbers and composition on five occasions over 15 months. This confirms both the wreck and the 'no fish' Marine Park B zone for 500 m around the wreck as a significant fish refuge which needs to be protected from fishing pressure. The relative stability of the fish community around the Yongala over the study period and the similarity of this community to that reported in 1981 suggests that the management of the site is effective for fish protection, despite thousands of diver days documented on the wreck each year. However, observations of resident fish with obvious damage indicates that care needs to be taken to ensure increasing numbers of divers do not have a detrimental effect on fish behaviour and residency. This study provides a crucial baseline against which to monitor the fish community of Yongala in the future.

**Marcovaldi, M. A., & dei Marcovaldi, G. G.** (1999). Marine turtles of Brazil: the history and structure of Projeto TAMAR-IBAMA. *In: Biological Conservation*, 91(1), 35-41.

**Abstract:** Projeto TAMAR-IBAMA, jointly administered by the Government of Brazil and the non-governmental organization Fundacao Pro-TAMAR, has established 18 conservation stations which cover 1100 km of the Brazilian mainland coast (in the states of Sao Paulo, Rio de Janeiro, Espirito Santo, Bahia, Sergipe, and Ceara). In the oceanic islands of Fernando de Noronha, Atol das Rocas, and Trindade, only the first has a permanently staffed station. The program was initiated in 1980 to investigate and implement a program for the conservation of sea turtles. As a direct result of TAMAR's efforts, the harvest of gravid females and of eggs has ceased in all major nesting areas. The success of the program is based on local participation of the fishing villages, including the employment of former egg poachers to patrol the beaches and protect the nests, education programs, and ecotourism. The majority of stations are staffed year round and not only promote the conservation of endangered sea turtles, but also organize community festivals, support local schools and health care facilities, and assist in developing alternative sources of income for residents who once relied on the exploitation of sea turtles. A similar effort to protect coastal feeding areas where incidental capture is high was initiated in 1991.

**Melezhik, V. A. et al.** (1999). Extreme  $^{13}\text{C}_{\text{carb}}$  enrichment in ca. 2.0 Ga magnesite-stromatolite-dolomite-'red beds' association in a global context: a case for the world-wide signal enhanced by a local environment. *In: Earth-Science Reviews*, 48(1-2), 71-120.

**Abstract:** The Palaeoproterozoic positive excursion of  $[\delta]^{13}\text{C}_{\text{carb}}$  is now considered as three positive shifts of  $[\delta]^{13}\text{C}_{\text{carb}}$  separated by returns to 0[permil], which all occurred between 2.40 and 2.06 Ma. This isotopic event is unique in terms of both duration (>300 Ma) and  $^{13}\text{C}$  enrichment (up to +18[permil]). The mechanism responsible for one of the most significant carbon isotopic shifts in Earth history remains highly debatable. To date,  $[\delta]^{13}\text{C}$  of +10[permil] to +15[permil] cannot be balanced by organic carbon burial (org) as there is no geological evidence for an enhanced Corg accumulation prior to or synchronous with the excursion. Instead, termination of these excursions is followed by formation of a vast reservoir of  $^{13}\text{C}$ -depleted organic material (-45[permil] at Shunga) and by one of the earliest known oil-generation episodes at 2.0 Ga. None of the three positive excursions of  $[\delta]^{13}\text{C}_{\text{carb}}$  is followed by a negative isotopic shift significantly below 0[permil], as has always been observed in younger isotopic events, reflecting an overturn of a major marine carbon reservoirs. This may indicate that org was constant: implying that the mechanism involved in the production of Corg was different. Onset of intensive methane cycling resulting in  $[\Delta]^{13}\text{C}$  change is another possibility. The majority of sampled  $^{13}\text{C}_{\text{carb}}$ -rich localities represents shallow-water stromatolitic dolostones, 'red beds' and evaporites formed in restricted intracratonic basins, and may not reflect global  $[\delta]^{13}\text{C}_{\text{carb}}$  values. Closely spaced drill core samples (n=73) of stromatolitic dolostones from the >1980±27 Ma Tulomozerskaya Formation in the Onega palaeobasin, Russian Karelia, have been analysed for  $[\delta]^{13}\text{C}_{\text{carb}}$  and  $[\delta]^{18}\text{O}_{\text{carb}}$  in order to demonstrate that different processes were involved in the formation of  $^{13}\text{C}_{\text{carb}}$ -rich carbonates. The 800 m-thick magnesite-stromatolite-dolomite-'red beds' succession formed in a complex combination of environments on the Karelian craton: peritidal shallow marine, low-energy protected bights, barred basins, evaporative ephemeral ponds, coastal sabkhas and playa lakes. The carbonate rocks exhibit extreme  $^{13}\text{C}$  enrichment with  $[\delta]^{13}\text{C}$  values ranging from +5.7 to +17.2[permil] vs. V-PDB (mean+9.9±2.3[permil]) and  $[\delta]^{18}\text{O}$  from 18.6 to 26.0[permil] vs. V-SMOW (mean 22.0±1.6[permil]). The Tulomozerskaya isotopic excursion is characteristic of the global 2.4-2.06 Ga positive shifts of carbonate  $^{13}\text{C}_{12}\text{C}$ , although it reveals the greatest enrichment in  $^{13}\text{C}$  known from this interval. An external basin(s) is considered to have provided an enhanced Corg burial and global seawater enrichment in  $^{13}\text{C}$ : the global background value for the isotopic shift at Tulomozero

time (ca. 2.0 Ga) is roughly estimated at around +5[permil]. An explosion of stromatolite-forming microbial communities in shallow-water basins, evaporative and partly restricted environments, high bioproductivity, enhanced uptake of  $^{12}\text{C}$ , and pene-contemporaneous recycling of organic material in cyanobacterial mats with the production and consequent loss of  $\text{CO}_2$  (and  $\text{CH}_4$ ?) are believed to be additional local factors which may have enhanced  $[\delta]^{13}\text{C}$  from +5[permil] up to +17[permil]. Such factors should be taken into account when interpreting carbon isotopic data and attempting to discriminate between the local enrichment in  $^{13}\text{C}$  and globally enhanced  $[\delta]^{13}\text{C}$  values. We propose that many previously reported  $[\delta]^{13}\text{C}$  values from other localities, where environmental interpretations are not available or have not been taken into account may not represent the global  $[\delta]^{13}\text{C}$  values

**Nowlis, J. S., & Roberts, C.** (1999). Fisheries benefits and optimal design of marine reserves. *In: Fishery Bulletin*, 97(3), 604-616.

**Abstract:** We used fishery population models to assess the potential for marine fishery reserves, areas permanently closed to fishing, to enhance long-term fishery yields. Our models included detailed life history data. They also included the key assumptions that adults did not cross reserve boundaries and that larvae mixed thoroughly across the boundary but were retained sufficiently to produce a stock-recruitment relationship for the management area. We analyzed the results of these models to determine how reserve size, fishing mortality, and life history traits, particularly population growth potential, affected the fisheries benefits from reserves. We predict that reserves will enhance catches from any overfished population that meets our assumptions, particularly heavily overfished populations with low population growth potential. We further predict that reserves can enhance catches when they make up 40% or more of fisheries management areas, significantly higher proportions than are typical of existing reserve systems. Finally, we predict that reserves in systems that meet our assumptions will reduce annual catch variation in surrounding fishing grounds. The fisheries benefits and optimal design of marine reserves in any situation depended on the life history of the species of interest as well as its rate of fishing mortality. However, the generality of our results across a range of species suggest that marine reserves are a viable fisheries management alternative

**Pomeroy, C.** (1999). Social considerations for marine resource management: Evidence from Big Creek Ecological Reserve. *In: Reports of California Cooperative Oceanic Fisheries Investigations*. (Report No. 40). [s. l.]: [s. n.].

**Abstract:** Growing interest in no take marine protected areas (MPAs) as a complement to traditional fishery management has led to increased attention to biophysical considerations for MPA design, implementation, management, and evaluation. Considerably less attention has been directed, however, toward social, cultural, and economic considerations for MPAs. Information on and understanding of the relationship between MPAs and local fisheries in social, cultural, and economic, as well as biophysical, terms is especially important. At the same time, there is growing interest in collaboration between fishers and scientists to provide more complete and accurate information on fisheries and marine ecosystems. Such collaboration is one element of cooperative (or co ) management of local fisheries, which is gaining recognition as potentially more effective, appropriate, and equitable than traditional, top down resource management. These two themes social considerations for MPAs and co management of local fisheries are central to a study being conducted at central California's Big Creek Ecological Reserve. This paper provides an overview of the local skiff fishery and the cooperative arrangement at Big Creek; discusses that arrangement as a form of co management, and as it has played an integral role in the history of the marine reserve; and concludes with observations and emerging questions about the social aspects of establishing and maintaining no take marine reserves in the context of local fisheries

**Swearer, S. E. et al.** (1999). Larval retention and recruitment in an island population of a coral-reef fish. *In: Nature*, 402(6763), 799-802.

**Abstract:** For close to a century, recruitment of larvae to a local population has been widely accepted as a primary determinant of marine population dynamics. However, progress in elucidating the causes of recruitment variability has been greatly impeded by our ignorance of the sources of recruits. Although it is often assumed that recruitment is independent of local reproduction, there is increasing circumstantial evidence that physical and behavioural mechanisms could facilitate larval retention near source populations. To develop a direct method for reconstructing the dispersal history of recruiting larvae, we put forward the hypothesis that differences in nutrient and trace-element concentrations between coastal and open oceans could result in quantifiable differences in growth rate and elemental composition between larvae developing in coastal waters (locally retained) and larvae developing in open ocean waters (produced in distant locations). Using this method, we show that recruitment to an island population of a widely distributed coral-reef fish may often result from local retention on leeward reefs. This result has implications for fisheries management and marine reserve design, because rates of dispersal between marine populations--and thus recruitment to exploited populations--could be much lower than currently assumed

**Wallace, S. S.** (1999). Evaluating the Effects of Three Forms of Marine Reserve on Northern Abalone Populations in British Columbia, Canada. *In: Conservation Biology*, 13(4), 882-887.

**Abstract:** Marine reserves have been suggested as tools for assisting the management of fisheries by protecting vulnerable marine species from overexploitation. Although there is a theoretical basis for believing that marine reserves may serve as management tools, there are few marine reserves in the world in which to test their effectiveness. My research evaluated three forms of marine reserve on the south coast of Vancouver Island, British Columbia, Canada. I used northern abalone (*Haliotis kamtschatkana*), a severely depleted shellfish in this region, as an indicator of the effectiveness of the reserves. Abalone populations in eight sites receiving different degrees of spatial protection were counted and measured in situ during the spring of 1996 and 1997. In all sites with enforced harvest closures, populations of abalone were greater, and one site with nearly 40 years of protection had on average much larger (older) abalone. Reproductive output, as a function of abundance and size, was also greater in the enforced reserve areas. Larval dispersal from reserves, and hence the benefit to exploited areas, was not formally surveyed. Nevertheless, the results of my study, combined with knowledge of present abalone populations, life history, and regional hydrodynamics, suggest that establishment of reserves is justified in the absence of perfect knowledge of larval dispersal.

**Bianchi, C. N., & Morri, C.** (2000). Marine Biodiversity of the Mediterranean Sea: Situation, Problems and Prospects for Future Research. *In: Marine Pollution Bulletin*, 40(5), 367-376.

**Abstract:** Mediterranean marine biodiversity has received only a fraction of the attention accorded to its terrestrial counterpart, despite the great cultural and economic importance that the sea has been having for the Mediterranean countries. A rough estimate of more than 8500 species of macroscopic marine organisms should live in the Mediterranean Sea, corresponding to somewhat between 4% and 18% of the world marine species. This is a conspicuous figure if one considers that the Mediterranean Sea is only 0.82% in surface area and 0.32% in volume as compared to the world ocean. The high biodiversity of the Mediterranean Sea may be explained by historical (its tradition of study dates older than for almost any other sea), paleogeographic (its tormented geological history through the last 5 my has been determining the occurrence of distinct biogeographic categories), and ecological (its variety of climatic and hydrologic situations within a single basin has probably no equals in the world) reasons. Present-day Mediterranean biodiversity is undergoing rapid alteration under the combined pressure of climate change and human impact, but protection measures, either for species or ecosystems,

are still scarce. To understand the role and patterns of Mediterranean marine biodiversity, marine ecological research should: first, re-value those scientific areas currently unfashionable with funding agencies (systematics, biogeography and taxonomy); second, start monitoring biodiversity with a long-term approach at a whole Mediterranean scale, possibly through an internationally co-ordinated network of marine protected areas

**Castilla, J. C.** (2000). Roles of experimental marine ecology in coastal management and conservation. *In: Journal of Experimental Marine Biology and Ecology*, 250(1-2), 3-21.

**Abstract:** The paper reviews the main findings of rocky shore and subtidal nearshore experimental marine ecology (EME) in cold and temperate marine ecosystems during the past four decades. It analyzes the role of EME in coastal management and conservation. The historical development of strategies for managing single or multispecies fisheries are reviewed. The published results show over-exploitation and depletion of more than 60% of the fish stocks and a lack of connection between the management of fisheries and results derived from experimental marine ecology. This is mainly due to: (a) the different temporal and spatial scale at which most marine ecologists and fishery managers operate; (b) the lack of long-term fishery monitoring and adaptive techniques for management; and (c) limitations in the design of experiments on fisheries. Large-scale oceanic perturbations, due to combinations of excessive resource exploitation and environmental variability coupled with present trends in management approaches are discussed. Modern approaches and tools for management of fisheries, such as Adaptive Management (AM), Territorial User Rights in Fisheries (TURFs), Individual Transferable Quotas and Non-Transferable Quotas (ITQs, INTQs) are discussed in the context of small-scale fisheries and EME. Published views on limits of applied ecological research with regards to management of fisheries are discussed. Linkages between EME, marine conservation and the establishment of Marine Protected Areas (MPAs) and experimental exclusions of humans are highlighted. Results derived from MPAs, such as: (a) species or community trophic cascades, and (b) the role of key-stone species and species interaction strengths, are discussed. It is concluded that the role of EME in conservation has been greater than has been the case in management of fisheries. The potential to link EME, conservation and the management of fisheries is exemplified through the proposed establishment in Chile of a connected network of Scientific Reserves, MPAs and TURFs sites. The final conclusion is that to cross-fertilize EME, conservation and management, there are three main challenges: (1) to end the traditional view of approaching the management of fisheries and marine conservation as contradictory antagonizing issues; (2) to improve communications between experimental marine ecology and the management of fisheries through the implementation of experimentation and adaptive management; (3) to improve linkages between marine conservation, the management of fisheries and social sciences.

**Chiappone, M., & Sealey, K.** (2000). Marine reserve design criteria and measures of success: Lessons learned from the Exuma Cays Land and Sea Park, Bahamas. *In: Bulletin of Marine Science*, 66(3), 691-705.

**Abstract:** Among the many potential benefits of no-take marine reserves, three important postulated effects are (1) to supply biomass of harvestable individuals to fished areas through emigration; (2) to increase spawning-stock biomass, which subsequently magnifies larval recruitment; and (3) to restore more natural size-frequency distributions of the protected populations, specifically to enhance the larger size classes, which may affect sex ratios and reproductive output. The Exuma Cays Land and Sea Park (ECLSP), covering 442 km<sup>2</sup> in the central Bahamas, was established in 1958 and closed to fishing in 1986, making it one of the first and largest marine reserves or 'no-take' zones in the western Atlantic. The ECLSP is ideally situated between small-scale developments in the northern and southern Exuma Cays and encompasses a diversity of contiguous shallow-water habitats from the Great Bahama Bank

to the eastern platform margin in Exuma Sound. Scientific investigations during the past decade have compared queen conch, spiny lobster, and grouper resources in the ECLSP to those in adjacent fished areas and have demonstrated greater species diversity, density, biomass, potential reproductive output, and larval densities for these species. The lack of historical data limits determination of whether closure to fishing has resulted in increases in these attributes over time, but available data strongly support the contention that the ECLSP has significantly greater spawning-stock biomass of various organisms because of protection from fishing. Although evidence is strong that the ECLSP is an important source of larvae to adjacent areas in the Exuma Sound ecosystem, few data show adult emigration to fished areas. Some target species outside the reserve may have declined, and because the ECLSP probably depends on larval transport from upcurrent areas, awareness is growing that this reserve will not be successful in isolation. Experiences in the ECLSP suggest that marine reserves will be most successful if they contain contiguous habitats from bank to deeper shelf (>30 m) environments, minimize threats such as coastal development, and provide protection of unique features such as spawning aggregations.

**Chiappone, M., Sluka, R., & Sealey, K.** (2000). Groupers (Pisces : Serranidae) in fished and protected areas of the Florida Keys, Bahamas and northern Caribbean. *In: Marine Ecology Progress Series*, 198, 261-272.

**Abstract:** Groupers (Pisces: Serranidae) of littoral environments of warm-temperate and tropical regions have experienced intense fishery exploitation. Indicators of intense fishing include declines or change in abundance, size, spawning aggregations, and species composition. Surveys of grouper were carried out from 1995 to 1997 in the Florida Keys, central Bahamas, southeastern Cuba, and the southeastern Dominican Republic to illuminate patterns in species composition, abundance, and size, along a gradient of relative fishing pressure. We assumed that the diversity, composition, density, and size would serve as indicators of fishing pressure in these areas. The study locations included 2 national parks and a national marine sanctuary, and were categorized as: (1) intensively fished with little or no management for groupers (southeastern Cuba, southeastern Dominican Republic), (2) intensively fished with numerous gear and effort regulations (Florida Keys), (3) lightly fished with some gear and effort regulations (northern and southern Exuma Gays, Bahamas), and (4) a no-take marine fishery reserve closed to fishing (Exuma Gays Land and Sea Park, Bahamas). On each site 10 to 20 strip transects (20 m x 5 m) were surveyed in water of 1 to 20 m depth over rocky hard-bottom habitats for density and size of grouper. Nine grouper species (2 *Cephalopholis* spp., 4 *Epinephelus* spp., and 3 *Mycteroperca* spp.) were documented among all areas. Results show that areas where grouper fishing was relatively light had greater numbers of species, density, and biomass, particularly for larger species such as Nassau grouper *E. striatus*. Classification of groupers by 3 life history categories or growth strategies (small, intermediate, and large) indicated significant differences in density and biomass among study areas. The density and biomass of larger grouper species were significantly greater in the no-take marine reserve and lightly fished areas than in the more intensively fished areas. In 3 of the areas characterized as intensively fished, one of which has several grouper fishery regulations, grouper density and biomass were dominated by small, non-targeted species such as the graysby *C. cruentatus* and the coney *C. fulva*. This pattern may indicate a second-order effect of fishing, indicative of potential changes in competition or predation. No-take marine fishery reserves represent a viable means to protect grouper resources, simplifying enforcement relative to complex catch and effort regulation, but also potentially alleviating the need to gather fisheries-dependent data.

**Dahlgren, C. P., & Sobel, J.** (2000). Designing a Dry Tortugas ecological reserve: How big is big enough?... To do what? *In: Bulletin of Marine Science*, 66(3), 707-719.

**Abstract:** A review of the global experience with no-take marine reserves strongly suggests that they are important tools for marine conservation and fishery management, capable of providing benefits in the form of ecosystem protection, improved fishery yields, expanded understanding of marine systems, and improved nonconsumptive opportunities. The degree to which a reserve will provide certain benefits or achieve specific goals will vary with species, depending on life-history characteristics and various aspects of reserve design. The Florida Keys National Marine Sanctuary management plan created a network of no-take reserves encompassing just 0.5% of the sanctuary's total area but provided for the creation of a Dry Tortugas Ecological Reserve, an additional marine reserve in and adjacent to the Dry Tortugas region of the sanctuary. The existing reserves are small because they were intended to provide only limited fishery benefits, but additional fishery benefits are being considered among the objectives of a Dry Tortugas reserve. How big must such a reserve be to provide specific benefits, and how can one predict this size without having one? We use a simple model based on the percent of virgin biomass (%B-0) in fished and unfished areas to provide managers with a quick and easy way of estimating the reserve size required to meet specific management objectives. Analyses of %B-0 for populations in fished and reserve areas suggests that a Dry Tortugas reserve encompassing at least 30-40% of the region is required to elevate: all stocks from current levels to overfishing-threshold %B-0 levels, but smaller reserves might be used to complement conventional fisheries-management practices; as a buffer against some level of overfishing and insurance against complete stock collapse.

**Dayton, P. K. et al.** (2000). Marine reserves: Parks, baselines, and fishery enhancement. *In: Bulletin of Marine Science*, 66(3), 617-634.

**Abstract:** Coastal zones are usually managed with two main objectives: (1) conservation/maintenance of biodiversity and intrinsic ecosystem services and (2) maintenance of sustainable fisheries. The management needs that can be met with marine protected areas fall into corresponding categories. First, fully protected (that is, no-take) reserves-parks-offer benchmarks and protect ecosystem integrity while encouraging research, education, and aesthetic appreciation of nature. Second, by allowing focused local control of human impacts, marine protected areas can be used to focus more intense local management designed to increase yield and allow research to help define sustainability and protect against uncertainty by using carefully managed fisheries as a research tool. We have been gambling with the future by establishing a poor balance between short-term profit and long-term risks. The absence of meaningful, fully protected reserves has produced a situation in which there are virtually no areas north of the Antarctic in the world's oceans that have exploitable resources where scientists can study natural marine systems. In most areas the higher-order predators and many other important species have been virtually eliminated; many benthic habitats have been much changed by fishing activities. Without solid data documenting changes through time, the relative merits of various causes and effects that operate in complex ecological systems can always be argued. Without natural systems important questions cannot be studied-for example, how the ecosystem roles of various species can be assessed, how they can be managed in a sustainable manner, and how we can evaluate resilience or relative rates of recovery. Networks of fully-protected reserves could facilitate research into such questions, contribute to the recovery of many coastal systems, and enable society to enrich its existence by observing species that should be part of its heritage (Murray et al., 1999). The use of marine protected areas as fishing refugia has met strong resistance by fishers and many managers, and it is misunderstood by many conservation biologists because different proponents have different, usually simplistic, visions. It is important to spell out the objectives of each proposed example. Our essential habitat perspective emphasizes that each situation depends on specific life-history parameters and emphasizes critical thresholds in population dynamics, including density and behavior for fertilization, transport processes, settlement, survivorship, and growth to maturity.

These are extremely difficult problems, and we cannot expect simplistic solutions to be effective. The only basis for optimism is that most of the seriously affected species are not yet extinct, and we still have a little time to establish permanent fully protected reserves to allow mankind to appreciate its rich but much depleted biological heritage. At least in some systems recovery can be measured over short time scales (<10 yrs), whereas others are much slower. Society as a whole is the ultimate stakeholder, not only the commercial and sports fishing industries that so dominate the public arena. Society will have to play a more active role if these species and habitats are to be saved.

**Frnak, K. T., Shackell, N., & Simon, J. E.** (2000). An evaluation of the Emerald/Western Bank juvenile haddock closed area. *In: ICES Journal of Marine Science*, (57), 1023-1034.  
**Abstract:** A juvenile haddock (*Melanogrammus aeglefinus*) closed area was established on the offshore banks (Emerald and Western) of the central Scotian Shelf (NAFO Div. 4W) in 1987. The management objective associated with this measure was to protect incoming recruits and thereby allow the stock to rebuild. Our evaluation of the effectiveness of the closed area revealed that the management objective was not fully met. The expected trend of declining juvenile mortality after, and high mortality preceding its imposition, was not readily apparent. The lack of response may have been due to several factors: (i) the proportion of juveniles within the closed area steadily declined and a majority of year classes during the post-closure period remained unprotected; (ii) the closed area remained open to fishing by fixed gear whose catches inside the closed area and surrounding areas steadily increased; and (iii) the resident haddock stock deteriorated in terms of growth and condition due to a combination of historical over-exploitation and large-scale environmental changes. The closed area does appear to have had some benefit to other groundfish species in terms of increased abundance, notably American plaice (*Hippoglossoides americanus*) and winter flounder (*Pseudopleuronectes americanus*)

**Griffiths, M. H.** (2000). Long-term trends in catch and effort of commercial linefish off South Africa's Cape Province: Snapshots of the 20(th) century. *In: South African Journal of Marine Science*, 22, 81-110.  
**Abstract:** The Cape commercial line fishery, established during the first half of the 19(th) century, currently consists of about 2 500 vessels (+/- 20 000 crew), which land some 15 500 tons of fish each year. In spite of a long history, a lack of a long-term catch and effort data series has severely hindered the management of the fishery. This paper provides commercial catch and effort data for three periods during the 20(th) century: 1897-1906, 1927-1931 and 1986-1998. Trends in catch per unit effort (cpue) were verified with additional data from the inshore trawl-fishery, from fishery-independent surveys and, where possible, stock assessment. According to a Linefish Management Protocol developed for the linefishery, any stock demonstrating a historical reduction in cpue or catch contribution of more than 75% is to be regarded as overexploited. Evaluations based on present datasets support this arbitrarily determined reference point for cpue. but reveal that catch composition is a poor indicator of stock status and should be used with caution. In spite of technological advances such as the advent of combustion engines, nylon lines, echo-sounders, electronic navigational aids, onboard freezer facilities and larger vessels, declines in catch rare indicative of severe overexploitation (i.e. 75-99%) were observed for many important linefish species during the 20th century. Most of these were higher-trophic-level species from the warm/temperate East Coast. several of which are also endemic. Life-history characteristics of the vulnerable species (i.e those demonstrating declines in cpue of > 75%) include predictable location in time and space (either coastal migrant or resident), longevity (> 15 years) and late maturity (relative to maximum age). Apart from reduced productivity associated with stock depletion, other setbacks, such as ecosystem alteration, loss of genetic diversity and shortterm commercial extinction, are also

anticipated. In order to rebuild depleted linefish stocks it is deemed essential to create additional marine reserves, dramatically improve enforcement, develop extensive public awareness programmes and substantially reduce commercial effort.

**Guenette, S., Pitcher, T. J., & Walters, C. (2000).** The potential of marine reserves for the management of northern cod in Newfoundland. *In: Bulletin of Marine Science*, 66(3), 831-852. **Abstract:** Marine reserves (areas closed to exploitation of marine life) should allow better resilience to management errors such as overestimation of stocks, inadequate control of fishing effort, and inaccurate catch statistics. We employed a detailed population model to explore the use of marine reserves to protect cod populations from overexploitation. The northern cod of the east coast of Newfoundland in the 1980s, at low biomass but prior to the major collapse, was used, as a case study. We asked two questions: Would marine reserves have prevented the 1992 collapse, and how would reserves compare with other management measures? The model is age- and spatially-structured and includes a recruitment function (Beverton and Holt type). Migrations were simulated by inclusion of target cells (attraction sites), which were specific for each age and month of the year. Random movements around target cells determined how fish spread to form a spatial distribution that moved along the seasonal trajectory defined by the target cells. Fishing was calibrated from historical data on temporal and spatial distribution of effort for three types of gears (trawl, gill net, trap). Marine reserves were modeled alone or in conjunction with temporal closures. For the 1980s low cod biomass, if used alone, only large reserves (80% of the fishing grounds) would have prevented the collapse and allowed the cod stock to rebuild. However; these very large reserves would have reduced the catch per unit effort on the remaining fishing grounds and possibly triggered an increase in investment in gear, defeating the purpose of the reserve. At low cod biomass, reserves must be accompanied by a reduction in fishing capacity. When used with reserves of moderate size (20%), temporal closures to trawls and gill nets succeeded in preventing a collapse and rebuilding the stock.

**Harris, P., & Collins, M. R. (2000).** Age, growth and age at maturity of gag, *Mycteroperca microlepis*, from the southeastern United States during 1994-1995. *In: Bulletin of Marine Science*, 66(1), 105-117.

**Abstract:** The gag, *Mycteroperca microlepis*, is one of the most important snapper grouper complex species harvested commercially in the southeastern United States. We investigated the age, growth, and age at maturity of gag in the South Atlantic Bight (SAB) during 1994 and 1995. Otoliths were collected from 1964 gag, of which ages were obtained for 1783 specimens with a mean length of 820 mm TL and a median age of 5 yrs old. Data collected during 1994-95 were compared to data collected from the SAB during 1976-82. Observed mean lengths at ages 1 through 10 and age-18 were significantly larger during 1994-95 than 1976-82 ( $P < 0.05$ ). The age at first maturity decreased by one year from 3.8 yrs old in 1976-82 to 2.8 yrs old in 1994-95. The maturity-at-age curves were significantly different ( $P < 0.01$ , probit analysis). Our study shows significant changes in some life history parameters that may have resulted from increases in fishing mortality. Given the limitations of other potential management strategies, a system of "marine reserves" may be the most practical method of stabilizing the population of gag in the SAB

**Jennings, S. (2000).** Patterns and prediction of population recovery in marine reserves. *In: Reviews In Fish Biology And Fisheries*, 10(2), 209-231.

**Abstract:** Marine reserves (no-take zones) are widely recommended as conservation and fishery management tools. One potential benefit of marine reserves is that they can reduce fishing mortality. This can lead to increases in the abundance of spawners, providing insurance against recruitment failure and maintaining or enhancing yields in fished areas. This paper considers the factors that influence recovery following marine reserve protection, describes

patterns of recovery in numbers and biomass, and suggests how recovery rates can be predicted. Population recovery is determined by initial population size, the intrinsic rate of population increase  $r$ , and the degree of compensation (increases in recruits per spawner as spawner abundance falls) or depensation (lower than expected recruitment at low abundance, Allee effect) in the spawner-recruit relationship. Within a reserve, theoretical recovery rates are further modified by metapopulation structure and the success of individual recruitment events. Recovery also depends on the extent of reductions in fishing mortality ( $F$ ) as determined by the relationship between patterns of movement, migration, and density-dependent habitat use (buffer effect) in relation to the size, shape and location of the reserve. The effects of reductions in  $F$  on population abundance have been calculated using a variety of models that incorporate transfer rates between the reserve and fished areas, fishing mortality outside the reserve and life history parameters of the population. These models give useful indications of increases in production and biomass (as yield per recruit and spawners per recruit respectively) due to protection, but do not address recruitment. Many reserves are very small in relation to the geographical range of fish or invertebrate populations. In these reserves it may be impossible to distinguish recovery due to population growth from that due to redistribution. Mean rates of recovery can be predicted from  $r$ , but the methods are data intensive. This is ironic when marine reserves are often favoured for management or conservation in data-poor situations where conventional stock assessment is impossible. In these data-poor situations, it may be possible to predict recovery rates from very low population sizes by using maximum body size or age at maturity as simple correlates of the intrinsic rate of natural increase.

**Johnson, A. K. L., & Ebert, S. P.** (2000). Quantifying Inputs of Pesticides to the Great Barrier Reef Marine Park - A Case Study in the Herbert River Catchment of North-East Queensland. *In: Marine Pollution Bulletin*, 41(7-12), 302-309.

**Abstract:** The Great Barrier Reef Marine Park (GBRMP) is an ecosystem whose ecological features are recognized internationally. There is a need to evaluate the impacts of historical and contemporary changes in land use on the GBRMP. This paper quantifies pesticide inputs in the Herbert River catchment of North Queensland in the context of changes in land use over the last 100 years. We show that three major phases of rural land use and land cover change have occurred, with large areas of native vegetation converted to agricultural production. The increase in agricultural land has seen a corresponding increase in the area receiving pesticides. We present data showing application histories for organochlorine, organophosphate, phenoxy, triazine, urea, mercurial and azole group pesticides. While the fate of these pesticides in aquatic and marine systems is largely unknown, these trends pose a significant challenge for agricultural industries in complying with the principles of ecologically sustainable development (ESD)

**Lindeman, K. C. et al.** (2000). Developmental patterns within a multispecies reef fishery: Management applications for essential fish habitats and protected areas. *In: Bulletin of Marine Science*, 66(3), 929-956.

**Abstract:** Diverse information sets and regulatory mechanisms are necessary for the management of essential fish habitats (EFH) and protected areas involving multispecies fisheries. We therefore identified key pelagic and demersal developmental patterns among the 73 species of the snapper-grouper complex of the South Atlantic Fishery Management Council. Twenty-two potential spawning aggregation sites for eight snapper species near the Dry Tortugas and Key West were identified by commercial fishermen. Mean larval duration estimates were available for 15 species and ranged from 14 to 75 d. Larval durations for grunts, snappers, and groupers are within the residence times of some gyres. Settlement areas are depth stratified and settlers often use shallower habitats than adults. Demersal stages of at least 50 species showed some degree of ontogenetic migration across the shelf, but most evidence

suggests that strict estuary dependence is a rare life-history strategy among the species in the complex; facultative use of estuaries is more common. Including key nursery habitats in protected areas may not safeguard early life stages affected by coastal construction projects unless the design process is coordinated among agencies responsible for water quality and habitat protection through tools such as EFH. Sites that consistently support spawning aggregations for multiple species require management both as EFH-Habitat Areas of Particular Concern and, potentially, as no-take protected areas. The most important known snapper spawning aggregation site in the lower Florida Keys is Riley's Hump. Despite a site closure in May and June, aggregations of several other snapper species are heavily fished later in the year. A year-round closure to protect both fish stocks and remaining habitat integrity is warranted.

**Lizaso, J. L. S. et al.** (2000). Density dependence in marine protected populations: A review. *In: Environmental Conservation*, 27(2), 144-158.

**Abstract:** The cessation or reduction of fishing in marine protected areas (MPAs) should promote an increase in abundance and mean size and age of previously exploited populations. Thus density-dependent changes in life-history characteristics should occur when populations are allowed to recover in MPAs. In this review, we synthesize the existing information on resource limitation in marine ecosystems, density-dependent changes in life-history traits of exploited populations and evidence for biomass export from MPAs. Most evidence for compensatory changes in biological variables has been derived from observations on populations depleted by high fishing mortality or on strong year classes, but these changes are more evident in juveniles than in adults and in freshwater rather than in marine systems. It is unclear if adults of exploited marine populations are resource limited. This may suggest that exploited populations are controlled mainly by density-independent processes, which could be a consequence of the depleted state of most exploited populations. MPAs could be a useful tool for testing these hypotheses. If we assume that resources become limiting inside MPAs, it is plausible that, if suitable habitats exist, mobile species will search for resources outside of the MPAs, leading to export of biomass to areas which are fished. However, it is not possible to establish from the available data whether this export will be a response to resource limitation inside the MPAs, the result of random movements across MPA boundaries or both. We discuss the implications of this process for the use of MPAs as fisheries management tools.

**Morgan, L. E. et al.** (2000). Spatial variability in growth and mortality of the red sea urchin, *Strongylocentrotus franciscanus*, in northern California. *In: Canadian Journal of Fisheries and Aquatic Sciences*, 57(5), 980-992.

**Abstract:** Natural and fishing mortality rates of the red sea urchin, *Strongylocentrotus franciscanus*, in northern California were estimated from growth increment and size distribution data under the assumption of a constant recruitment rate. Mean asymptotic test diameter, standard deviation of asymptotic test diameter, growth rate coefficient, and natural mortality rate were first estimated for three nominally unharvested sites, Bodega Marine Reserve, Caspar Closure, and Salt Point. These estimated growth and mortality parameters differed among sites, leading to substantially different yield-per-recruit surfaces. Estimates of fishing mortality rate from size distributions collected at 11 harvested sites were then calculated based on the growth and natural mortality estimates obtained from the Caspar Closure and Bodega Marine Reserve sites. Estimates of fishing mortality rate ranged from 0.11 to 1.87 times year<sup>-1</sup>. The alongshore pattern of fishing mortality rate was moderately correlated with landings and effort, but the spatial pattern of rare, strong recruitment events also appeared to influence values of fishing mortality rate. The positive bias in estimates of fishing mortality rate due to recruitment variability indicated that our observed pattern in estimated values for fishing mortality rate could have been caused by the historical spatial pattern of interannual variability in recruitment.

**Parker, S. et al.** (2000). Management of Pacific Rockfish. *In: Fisheries*, 25(3), 22-30.

**Abstract:** The American Fisheries Society (AFS) recognizes the need for conservative and robust management of Pacific rockfishes because of naturally low population growth, the overfished state of many of the stocks, and complex nature of the mixed-stock fisheries (60-plus species). The AFS recommends that catch information be collected on a species-specific basis, and that management targets also be established on a species-specific basis including species taken as bycatch. Such management will require accurate studies of discards at sea. Reduction in rockfish discards should be a management priority in all fisheries which capture significant numbers of rockfish. The AFS further recommends establishment of adequate fishery independent surveys to more accurately assess and monitor rockfish stocks. The AFS supports the establishment of systems of Marine Protected Areas to protect the habitat of Pacific rockfish and to promote recovery of stocks. Such areas should be established along with traditional management measures to control fishing mortality. Regardless of the management strategy used, substantial decreases in fishing mortality must be achieved soon to avoid stock collapses. The AFS encourages its members to become involved by providing technical information needed for protection of rockfish to international, federal, state, and provincial policy makers so decisions are made on a scientific, rather than emotional or political, basis

**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.

**Roberts, C.** (2000). Selecting marine reserve locations: Optimality versus opportunism. *In: Bulletin of Marine Science*, 66(3), 581-592.

**Abstract:** Location of most marine reserves has depended more on social criteria and opportunism than on scientific study. Nevertheless, numerous studies from many habitats and places around the world indicate that fully protected reserves (areas closed to all fishing) have shown clear benefits, at least within their boundaries. This evidence suggests that reserves will work in most areas they are placed. Many people are uncomfortable with this haphazard approach and worry that we should be looking to science to help optimize placement. Here I examine some of the key factors affecting reserve performance and ways they might influence our approach to locating reserves. Habitat quality, intensity of exploitation around reserves, area and proximity of other reserves, protected species' life history and dispersal characteristics, and boundary porosity all affect how reserves perform. Any reserve we create will involve trade-offs among different objectives. For relatively sedentary species, precise reserve placement appears relatively unimportant to performance, but for migratory species, much more precise placement will be necessary to encompass migration bottleneck and nursery areas. Two nonbiological factors are of overriding importance to performance. Fully protected reserves will achieve much more than those that allow limited take, and well-enforced reserves will be much more effective than poorly enforced ones. Rather than seeking to optimize

placement of individual reserves, we should construct networks of interacting reserves as a bet-hedging strategy against variability and uncertainty in the marine ecological processes, and resource-management policies, that affect reserve performance. Opportunism, informed by science, can achieve a great deal. The risk is much greater that we will fail to achieve our management objectives if we delay in order to embark upon lengthy studies than if we begin establishing reserves today on the basis of what we already know.

**Robinson, J.** (2000). A Guide to Historical U.S. Coast Survey Data Significant to Cultural Resource Management in the National Marine Sanctuaries. Maryland: Marine Chart Division, Office of the Coast Survey, National Ocean Service, National Oceanic and Atmospheric Administration. Silver Spring.

**Rogers Bennett, L., Haaker, P., & Karpov, K.** (2000). Selecting and evaluating marine protected areas for abalone in California. *In: Journal-of-Shellfish-Research*, 19(1), 530-531.  
Notes: Abstracts only

**Abstract:** Abalone populations have declined dramatically in California, resulting in the closure of the commercial and recreational fisheries south of San Francisco. Marine Protected Areas (MPAs) have been proposed as a tool to help restore declining abalone populations, *Haliotis* spp. but more information is needed to locate MPAs and to determine the efficacy of such areas. One simple yet practical plan for siting MPAs is to analyze historical cumulative catch data to identify areas which once supported large populations of target species. To do this, we examined spatially explicit catch data from the commercial fishery (1950-1996) to direct the selection of MPAs for abalone in California. San Clemente Island was the area of peak abundance of the now endangered white abalone, *Haliotis sorenseni* and the soon to be listed black, *Haliotis cracherodi*, pink, *Haliotis corrugata*, and green, *Haliotis fulgens* abalone, making this island uniquely suitable as an abalone restoration MPA. We also examined fishery independent data which included abundances and size frequency distributions of abalone inside and outside MPAs to examine the efficacy of existing MPAs. We found that the Anacapa Island MPA in the Channel Islands, where abalone fishing is excluded, supports higher populations of abalone than fished sites. Furthermore, remote parts of MPA that are not under the observation of the reserve manager, failed to protect pink abalone stocks which declined to zero as did neighboring fished sites. Therefore, we caution that while abalone abundances may be higher inside MPAs, effective enforcement of these areas is critical to their success.

**St Mary, C. M. et al.** (2000). Stage structure, density dependence and the efficacy of marine reserves. *In: Bulletin of Marine Science*, 66(3), 675-690.

**Abstract:** The habitat requirements of fishes and other marine organisms often change with ontogeny, so many harvested species exhibit such extreme large-scale spatial segregation between life stages that all life stages cannot be protected within a single marine reserve. Nevertheless, most discussions of marine reserves have focused narrowly on single life-history events (e.g., reproduction or settlement) or a single life stage (e.g., adult or recruit). Instead we hypothesize that an effective marine reserve system should often include a diversity of protected habitats, each appropriate to a different life stage. In such a case, the spatial configuration of habitats within reserves, and of separate reserves across larger spatial scales, may affect how marine resources respond to reserve design. We explored these issues by developing a mathematical model of a fish population consisting of two benthic life stages (juvenile and adult) that use spatially distinct habitats and examined the population's response to various management scenarios. Specifically, we varied the sizes of reserves protecting the two life stages and the degree of coupling between juvenile and adult reserves (i.e., the fraction of the protected juvenile stock that migrates into the adult reserve upon maturation). We examined the effects when density dependence operated in only the juvenile stage, only the

adult stage, or both. The results demonstrated that population stage structure and the nature of density dependence should be incorporated into the design of marine reserves but did not provide robust support for the general tenet that all life stages must be protected for an effective reserve system. The results indicated that biological considerations, alone, were insufficient for design of the optimal marine reserve. Instead, it was necessary to consider the value (e.g., socioeconomic or ecological) of each biological outcome; under some value functions, a mixed strategy (i.e., protecting both life stages) was best.. whereas for others, the best solution focused on a single life stage. Resolving issues of marine reserve design, especially for stage-structured populations, will require more detailed study of stage-structured populations and a more explicit integration of biological and socioeconomic models.

**Caddy, J. F., & Cochrane, K. L.** (2001). A review of fisheries management past and present and some future perspectives for the third millennium . *In: Ocean & Coastal Management*, 44(9-10), 653-682.

**Abstract:** A broad-brush review is provided of key issues and events of science-based fisheries management from historical times to the present. Key trends in fisheries assessment, control and surveillance, capacity and its relevance to marine fishery ecosystems are described, particularly those issues where FAO has played a key role. The paper also considers social and institutional issues of relevance. A perspective is offered for the evolution of possible fishery management paradigms that may apply at the start of the third Millennium.

**Jackson, J. B. C.** (2001). What was natural in the coastal oceans? *In: Proceedings Of The National Academy Of Sciences Of The United States Of America*, 98(10), 5411-5418.

**Abstract:** Humans transformed Western Atlantic coastal marine ecosystems before modern ecological investigations began, Paleocological, archeological, and historical reconstructions demonstrate incredible losses of large vertebrates and oysters from the entire Atlantic coast. Untold millions of large fishes, sharks, sea turtles, and manatees were removed from the Caribbean in the 17th to 19th centuries. Recent collapses of reef corals and seagrasses are due ultimately to losses of these large consumers as much as to more recent changes in climate, eutrophication, or outbreaks of disease. Overfishing in the 19th century reduced vast beds of oysters in Chesapeake Bay and other estuaries to a few percent of pristine abundances and promoted eutrophication. Mechanized harvesting of bottom fishes like cod set off a series of trophic cascades that eliminated kelp forests and then brought them back again as fishers fished their way down food webs to small invertebrates. Lastly, but most pervasively, mechanized harvesting of the entire continental shelf decimated large, long-lived fishes and destroyed three-dimensional habitats built up by sessile corals, bryozoans, and sponges. The universal pattern of losses demonstrates that no coastal ecosystem is pristine and few wild fisheries are sustainable along the entire Western Atlantic coast. Reconstructions of ecosystems lost only a century or two ago demonstrate attainable goals of establishing large and effective marine reserves if society is willing to pay the costs. Historical reconstructions provide a new scientific framework for manipulative experiments at the ecosystem scale to explore the feasibility and benefits of protection of our living coastal resources.

**Jamieson, G. S., & Link, J. S.** (2001). Marine protected areas in Canada - implications for both conservation and fisheries management. *In: Canadian Journal of Fisheries and Aquatic Sciences*, 58(1), 138-156.

**Notes:** Invited perspective for 100th Anniversary Issue.

**Abstract:** Legislated marine "protected" areas are now widely distributed throughout tropical and temperate waters, but the nature of human activities actually restricted in any area varies. This ambiguity about what "protected" means has resulted in contradictory claims as to both the benefits and costs of marine protected areas. A perspective is given here on the current status of

marine resource protection in Canada in general and British Columbia in particular. Described and discussed first is the history of Canadian marine protected areas established to date. Many areas are claimed to be protected, with little understanding by either the general public or even most marine resource experts as to what human activities are actually regulated by legislative designations. Secondly, an overview of biological reasons and objectives for marine protected areas is presented followed by a review of both the conservation and fisheries management effects and implications resulting from effective renewable resource protection. Finally, a unique qualitative scheme is proposed for classifying and describing marine protected areas of different types to determine relative measures of protection.

**Miller, P. et al.** (2001). Fish biodiversity and conservation. The Fisheries Society of the British Isles annual symposium, Leicester, UK, 9-13 July, 2001. *In: Journal of Fish Biology*, 59: Supplement A, vi + 387 pp.

**Abstract:** This is a compilation of 21 articles and 26 abstracts presented during The Fisheries Society of the British Isles Annual Symposium on Fish Biodiversity and Conservation held in Leicester, UK. The topics covered include: diversity of salmon from the Pacific Northwest; molecular analysis of hybridization between native westlope cutthroat trout and rainbow trout introduced in the southeastern British Columbia, Canada; genetic evidence for historical continuity between populations of the Australian freshwater fish *Craterocephalus stercusmuscarum* east and west of the Great Dividing Range; genetic introgression between wild and stocked brown trout in the Douro River basin, Spain; species and hybrid richness in spined loaches of the genus *Cobitis* (Teleostei: Cobitidae), with a checklist of European forms and suggestions for conservation; the threat of fishing to highly fecund fishes; the importance of managing within-species diversity in cod and herring fisheries of the northwestern Atlantic; home range size and use of space by Bermuda chub *Kyphosus sectatrix* in two marine reserves in the Soufriere Marine Management Area, St. Lucia, West Indies; larval supply to a marine reserve and adjacent fished area in the Soufriere Marine Management Area, St. Lucia, West Indies; effects of marine reserve characteristics on the protection of fish populations: a meta-analysis; anthropogenic changes in the freshwater fish fauna of Italy, with reference to the central region and *Barbus graellsii*, a newly established alien species of Iberian region; creating and destroying species; the new biodiversity and evolutionarily significant units among New Zealand's galaxiid fishes; status, habitat use, and vulnerability of the European grayling in Austrian waters; physiological performance of largemouth bass related to local adaptation and interstock hybridization: implications for conservation and management; conservation goals and fisheries management units for Atlantic salmon in the Baltic Sea area; comparative analysis of introgression at three marker classes: a case study in a stocked population of brown trout; influence of population decline, fishing, and spawner variability on the recovery of marine fishes; freshwater fish introductions in Spain: facts and figures at the beginning of the 21st century; Coelacanth: a human responsibility; the Irish pollan, *Coregonus autumnalis*: options for its conservation; and genetic diversity of coastal Northwest Atlantic herring populations: implications for management.

**Novaczek, I., Sopacua, J., & Harkes, I.** (2001). Fisheries management in Central Maluku, Indonesia, 1997-98. *In: Marine Policy*, 25(3), 239-249.

**Abstract:** Interviews with government staff responsible for fisheries management in Maluku, Indonesia in 1997-98 revealed problems in capacity, and an emphasis on economic development rather than management. The traditional institutions which persisted in some villages to regulate the access and withdrawal rights over key inshore species, were also disjunct from government departments. The period following December 1998 is marked by political upheaval, legislative change that (in theory) decentralized governance over inshore waters, and violent unrest centered in Maluku. All these make the data collected in 1997-98 of

historical interest. The state of fisheries management in Maluku remains undefined, pending further legislative reform and peace that will allow governments and communities to negotiate and implement new institutional arrangements.

**Pitcher, T. J.** (2001). Fisheries managed to rebuild ecosystems? Reconstructing the past to salvage the future. *In: Ecological Applications*, 11(2), 601-617.

**Abstract:** This paper presents the case for adopting ecosystem rebuilding as the goal of fisheries management. Movement toward this goal may represent the only hope for fisheries, as we know them, to exist 50 years in the future alongside essential services provided by marine ecosystems. First, I review archaeological, historical, and recent evidence that bears witness to a long, dismal record of overexploitation. Second, I examine the ecological effects of overfishing on aquatic ecosystems. Fish with life histories and spatial behavior inimical to harvesting are selectively removed, both within and among species. The loss of keystone species and the replacement of high-value, demersal resources with pelagic, rapid-turnover, low-value species shifts the nature of ecosystems, evidenced by accelerating local extinctions and a worldwide decline in trophic level. Disconcertingly, harvest limits that appear safe by single species evaluation can engender ecosystem changes that are hard to reverse. Driven by a progression of clever human harvest technologies, three ratchet-like processes have brought about episodes of depletion. "Odum's ratchet" is ecological in nature, comprising depletion and local extinction. "Ludwig's ratchet," economic in nature, is a positive feedback loop between increased catching power and serial depletion, driven by the need to repay borrowed money. "Pauly's ratchet" is cognitive, shifting the baseline of what each generation regards as primal abundance and diversity. Third, a rebuilding policy goal is distinguished from that of sustaining current catches and biomass, since the baseline can refer to present misery. In this sense, present policies can inadvertently foreclose future options for the generation of food, wealth, and services from ocean resources. A policy to rebuild ecosystems can reverse this trend and maximize economic value in tomorrow's markets, where supply will vastly outstrip demand for high-quality fish products. Fourth, I outline a novel methodology, termed "Back to the Future," that can implement a goal of ecosystem rebuilding. Models of past ecosystems are reconstructed using information about the presence and abundance of species from historical documents, archaeology, and local and traditional environmental knowledge (LEK and TEK). Economic evaluation compares past with present and alternative ecosystems. "Back to the Future" gives the TEK of aboriginal and indigenous peoples a valuable, direct function in resource management. Finally, I discuss two practical management measures, paralleling recent developments in terrestrial reconstruction ecology, the implementation of large no-take marine reserves, and the reintroduction of high-value species that were formerly endemic.

**Pyle, P. et al.** (2001). Historical and recent colonization of the South Farallon Islands, California, by northern fur seals (*Callorhinus ursinus*). *In: Marine Mammal Science*, 17(2), 397-402.

**Schittone, J.** (2001). Tourism vs. commercial fishers:; development and changing use of Key West and Stock Island, Florida. *In: Ocean & Coastal Management*, 44(1-2), 15-37.

**Abstract:** For more than 200 years, commercial fishing was the most important economic activity in Key West, Florida. Over the last 20 years however, this way of life has been squeezed off the island, until there is no longer a commercial (as opposed to charter) fishing industry present on the Key. The "squeeze" is attributable to space competition from businesses associated with the explosive growth of the tourism sector in recent years. This paper relates a bit of the historical background of both the commercial fishing and the tourism industries. It goes on to examine some of the economic factors that converged to displace fishing activity to a nearby Key (Stock Island). This case study considers some of the implications for Key West

of placing almost total economic reliance on the tourism segment.

**Vallega, A.** (2001). Urban waterfront facing integrated coastal management. *In: Ocean & Coastal Management*, 44(5-6), 379-410.

**Abstract:** Essentially, this paper aims at discussing the trends of waterfront development in the context of the urbanised coastal areas, and the possible integration between waterfront organisation and integrated management of the coastal area. To deal with this subject, first the external environment influencing waterfront evolution is considered, focusing on global change, the globalisation of economic systems, and geopolitical change. The diffusion of waterfront re-vitalisation programmes is considered in the context of the urban growth of coastal areas concentrating attention on the numerical increase of megacities and proto-megacities. The Ekistics theory, according to which urban growth will lead to the creation of the ecumenopolis (planetary urban system) including the marine ecumenopolis (urbanisation of all the coastal belts), is considered with the aim of foreshadowing the possible role which could be played by maritime waterfronts in the course of the 21st century. The focus then shifts to the waterfront itself considering the historical triggers for waterfront revitalisation plans. In this context the waterfront functions are incorporated into the coastal use structure by adopting a matrix-based representation. The expanding basis for conflicts between the waterfront functions is emphasised. A framework of options occurring in waterfront development is presented with the aim of responding to two questions: (i) how the waterfront may be designed to be consistent with sustainable development, in that acting as a top rank spatial system conforming to integrated management of the coastal area; (ii) whether and how the waterfront could act as a leading spatial system to carry out integrated management of the coastal area within which it is located. Discussion of the former question leads to designing the optimum choice among the possible objectives of waterfront management, while discussion of the latter question leads to considering the waterfront as the central subsystem of the coastal system, and to reckoning its organisation as including high-rank functions of the coastal area. Reasoning leads to focusing on the design of waterfronts able to optimise their integration into the coastal system, and their development within coastal management. To realise this prospect an international discussion on the waterfront-coastal area integration may be desirable in order to pursue two basic goals: (i) to explore how coastal area management and waterfront planning may usefully interact generating a long-term positive feedback; (ii) to design the optimum waterfront organisation, intended as a planning and management model to be used as a reference basis for integrating the waterfront functions with coastal management strategies.

**Young, Z., Makoni, G., & Boehmer-Christiansen, S.** (2001). Green aid in India and Zimbabwe - conserving whose community? *In: Geoforum*, 32(3), 299-318.

**Abstract:** What happens when global institutions try to assist community conservation in some of the world's least industrialised areas? Among the cutting edge' projects grant-aided by the Global Environment Facility (GEF, a World Bank-hosted fund for 'global environmental benefits') are 'CAMPFIRE' - the Communal Areas Management Programme For Indigenous Resources - in Zimbabwe, and 'India Ecodevelopment'. Both are intended to combine protection of biodiverse wildlife with participatory rural development for impoverished local communities. We explore the 'ground truths' of these projects in two historical and political contexts. We ask whether aspiring managers of 'global resources' can sufficiently transcend ongoing tensions in 'local political ecology', while diverse value systems and experiences remain distant. We conclude with thoughts about the 'sustainable development' of foreign missions old and new

**Feral, J. P.** (2002). How useful are the genetic markers in attempts to understand and manage marine biodiversity? *In: Journal of Experimental Marine Biology and Ecology*, 268(2), 121-

145.

**Abstract:** The genetics of marine populations is a subject that has made little progress compared with the effort spent on the terrestrial environment. This is so despite "applied" aspects such as stock management, marine aquaculture, creation of reserves, conservation of the coastal zones, taxonomy, and protection of species. The crowded and dispersive marine environment, with its steep physical gradients, favours the existence of a planktonic larval stage for most species. The attendant high fecundity has important consequences for selection differentials and dispersal and therefore for the evolution of genetic structures. These features must be taken into account in order to understand the origin and maintenance of marine biodiversity and, in some cases, to manage it. In this article, after a definition of genetic diversity among other aspects of biodiversity, special features of the marine environment and processes governing genetic diversity are given together with the molecular tools required to study it. Then, an overview of the interesting scientific questions in marine biodiversity research is given concerning: - the population structure as a function of dispersal systems and spatial constraints: gene flow and speciation in a dispersive environment, - the phylogeography and historical biogeography of marine ecosystems; - the functional and adaptive aspects of polymorphism: larval phase and genetic control of recruitment. Some uses of genetic diversity for assessment, conservation and protection purposes are also detailed. Organismal (specific) diversity does not enter the scope of the article.

**Gerber, L. R., Kareiva, P., & Bascompte, J. (2002).** The influence of life history attributes and fishing pressure on the efficacy of marine reserves. *In: Biological Conservation*, 106(1), 11-18.

**Abstract:** Two key questions regarding "no-take" marine reserves are: (1) how effective are reserves likely to be, and (2) how does effectiveness vary with life history attributes and the relative size of reserves. To investigate these questions, we use a simple Ricker model that includes fishing, larval dispersal, and larval loss while in a planktonic pool, and that tracks protected and unprotected populations. We applied two different measures of reserve effectiveness to our simulation results. One metric was intended to reflect goals oriented towards conservation and the second was intended to reflect fishery enhancement goals. Both metrics compare the situation before reserves are established to after the reserve has been in place and a new equilibrium was reached. Yield effectiveness is defined as the total equilibrium annual harvest after reserves are established divided by the total annual harvest before reserves are established. Conservation effectiveness is defined as the average adult density inside the reserve divided by the average density in the same area prior to reserve establishment. A substantial fraction of the 5120 simulated parameter combinations representing different harvest rates and life history attributes went extinct in the absence of a reserve, and these scenarios leading to extinction could be predicted accurately (85% aptly classified) simply on the basis of exploitation rate and population growth rate. Of the cases that did not go extinct, we compared the performance of reserves as measured by each effectiveness metric. Few of the cases (less than 8%) produced effective reserves as measured in terms of increased harvest; whereas over half of the cases resulted in effective reserves as measured by conservation effectiveness. Moreover, the two measures of reserve effectiveness were only weakly correlated. Simple linear regression or polynomial regression could explain at most 23% of the variation in reserve effectiveness as measured by either metric. As expected, the size of the reserve area had a marked and typically negative effect on total annual yield, which suggests that while marine protected areas may do a good job of conserving protected populations, there will generally be pressure from the fishing community to keep them small because of their tendency to reduce total catch.

**Grosholz, E. (2002).** Ecological and evolutionary consequences of coastal invasions. *In:*

Trends in Ecology & Evolution, 17(1), 22-27.

**Abstract:** Although coastal estuarine and marine systems are among the most heavily invaded systems in the world, the study of nonindigenous species in these systems has, historically, lagged behind that of terrestrial and freshwater systems. However, in the past decade, a rapid increase in studies of coastal invasions has provided important insight into the invasion process in these systems and how these invasions might differ qualitatively from invasions elsewhere. Based on new evidence for cryptic species invasions, hybridization among invaders and native species, impacts on multiple species and ecosystems, and the rapid and extensive geographical spread of invaders, it is clear that the ecological and evolutionary consequences of invasions in heavily invaded coastal habitats might be more extensive than previously realized. Although these studies have produced important new advances, many other areas remain relatively unexplored and are ripe for future investigation.

**Kastelein, R. A. et al.** (2002). Food intake and body measurements of Atlantic bottlenose dolphins (*Tursiops truncatus*) in captivity. *In: Marine Environmental Research*, 53(2), 199-218.

**Abstract:** The food consumption (recorded in kg of individual fish species), body length and mass of 11 Atlantic bottlenose dolphins kept first at Windsor Safari Park, UK (1979-1993/1994), and later at Harderwijk Marine Mammal Park, The Netherlands (1993/1994-1995) are reported. This broad-scale, longitudinal study is based on historical data that were originally recorded for short-term husbandry purposes. The chemical composition and caloric value of the diet were variable and were not recorded. The food intake quantities should therefore be viewed as rough weight estimates of what wild conspecifics might eat (depending on their diet). The average annual food consumption of adult males and non-pregnant, non-lactating females was approximately 2000 kg of fish (estimated at 176 x 105 kJ). Food consumption showed little increase during gestation, but was 58-97% higher during lactation than during similar periods in non-reproductive years. All six calves began to eat solid food within a year of birth although suckling continued for 14-37 months after birth. The pattern of food intake of mothers and calves varied substantially between suckling periods. No seasonal changes in food consumption were detected, although there were small seasonal changes in water temperature. Births occurred at various times of year, since the timing of mating varied between years. The animals' body length increased rapidly during the first 3 years of life after which the growth rate decreased. Body length reached asymptote at approximately 270 cm. Adults of both sexes weighed around 260 kg. The relationship between standard body length (in cm) and body mass (in kg), although based on a small sample size (n=16), can be expressed as  $MASS = 17.261e0.0156(\text{body length} - 100)$ . Animals weighing 155-225 kg consumed between 2 and 4% of their body mass per day.

**Kent Smedbol, R., & Wroblewski, J. S.** (2002). Metapopulation theory and northern cod population structure: interdependency of subpopulations in recovery of a groundfish population. *In: Fisheries Research*, 55(1-3), 161-174.

**Abstract:** The spatial structure of the northern Atlantic cod (*Gadus morhua*) population inhabiting the coastal and offshore regions of eastern Newfoundland and Labrador is analyzed using metapopulation concepts. Evidence for subpopulation structure is drawn from published studies of spawning times and locations, life history traits, and genetic differentiation. Putative subpopulations are associated with spawning areas near offshore banks and in coastal bays. Metapopulation theory predicts that fewer spawning areas would be occupied as the population declines. This prediction is substantiated in that Saglek, Nain, Makkovik and Harrison Banks have had no significant spawning activity since the over-exploitation of the northern cod by trawlers during the 1960s. The corollary prediction is that as the population recovers, currently unoccupied spawning areas will be recolonized. The model suggests a continued moratorium on fishing the remaining subpopulations would promote recolonization and accelerate the

recovery of the overall metapopulation. There are limitations in the application of metapopulation theory to marine fish populations such as the northern cod. However, fisheries management strategies for stock rebuilding would benefit from research which improves our understanding of the interdependency of subpopulations, the persistence of the overall population, and the processes involved in recovery of a collapsed metapopulation.

**Adams, P. B.** ([s. d.]). Life history patterns in marine fishes and their consequences for fisheries management. In: Fishery Bulletin, (78), 1-12.

**Abstract:** Natural selection operates at the life history level to maximize the number of surviving offspring. Life history characteristics will vary in consistent patterns to meet this constraint. When theoretical patterns in life histories are investigated in terms of r and K selection and compared with actual trends in life history characteristics of fishes the agreement between observed and predicted trends was significant. The effects of harvesting on stocks with these life history trends were investigated and it was found the K selected type species would be highly sensitive to over-fishing and, once depleted, recovery would require a long time.

**[Anon. ]** ([s. d.]). Indonesia: components for effective marine conservation. Proceedings of the 7th International Coral Reef Symposium [s. 1.]: [s. n.]

**Abstract:** The Indonesian Archipelago has a coastline of about 80,000 km, which includes some of the most productive and diverse coastal ecosystems on earth. The Indonesian coastal ecosystems are also among the most heavily exploited, especially where human population densities are high. Three main steps need to be taken in order to execute effective management programs: 1) research the ecological aspects of the reef systems; 2) produce an inventory of adverse human influences; and 3) raise public awareness through participation of communities and politicians. The most effective way to take these steps is by bilateral or multilateral cooperation and a multidisciplinary approach. The components are considered here, using examples from current and proposed activities representing some of the most long term on-going marine conservation programs in Indonesia. ii. This study evaluated a method used by the Republic of France to protect discrete marine areas of shoreline and adjacent coastal waters through designation of sites as marine nature reserves. Although much smaller in size than many national marine sanctuaries in the United States, the reserves in France represent successful efforts to protect and manage coastal marine areas. This is due in part to a high amount of local involvement during the designation process; the use of advisory committees at the reserves, as well as scientific committees that develop and conduct research projects within the sites; and the use of core areas, in which almost all human activities are prohibited or restricted, to promote re-populating of fish communities and to increase species diversity. The initiative for creating the reserves begins at the local level and is coordinated among local officials, user groups, environmental organizations, and the national government. This study describes the legal framework in which the reserves are created and examines aspects of management, scientific research, and law enforcement of a marine reserve.

It has been hypothesized that nature reserves should be as circular as possible to maximize the total number of species conserved. Using multiple regression, this study examined the relationship between species richness on oceanic islands and island shape for 33 data sets. After accounting for the effect of island area, island shape does not explain a significant amount of the residual variation in species number in more data sets than expected due to chance alone. It is concluded that if the mechanisms controlling species richness on oceanic islands and isolated patches of terrestrial habitat are the same, then shape is not of major concern in the design of nature reserves.

Increased human activities in the coastal zone has brought about an increase in user conflicts and marine resource exploitation. This article discusses the advantages of marine reserves,

specifically for the enhancement of fisheries populations. The author discusses life history strategies of coral reef organisms and the susceptibility of fishery target species to over-fishing. An overview of problems associated with creating marine reserves is discussed.

Reef species are vulnerable to over-fishing because of their life history characteristics. Various fisheries for reef species have declined worldwide, including the Caribbean, Gulf of Mexico, and U.S. South Atlantic. Traditional fishery management techniques may not be practical or effectively deal with certain problems, such as by-catch and release mortality. Marine fishery reserves, areas with no consumptive usage, provide an alternative management approach with attractive attributes from a fishery prospective. Marine fishery reserves ~ improve reef fish fisheries by protecting species composition, population age structure, spawning potential, and genetic variability within species. Reproductive output from reserves would help re-supply fished areas by natural egg and larval dispersal. Properly located reserves of adequate size could protect the quantity and quality of reproductive output, reduce recruitment uncertainty due to environmental variation, and ensure against management failure. Substantial empirical evidence shows that protection from fishing has increased fish abundance and availability inside and outside protected areas. A model of the red snapper fishery in the Gulf of Mexico with 20 percent of the habitat protected by reserves, show that total egg production was potentially 1,200 percent greater than under the status quo. Uncertainties remain concerning the ideal number, location, and size of reserves necessary to achieve management objectives

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

**Coulombel, A.** ([s. d.]). Mollusques marins fossiles du quaternaire de Mauritanie. *In: Bulletin Des Amis De La Nature En Mauritanie*, (n° spécial), 1-70 + Bibliographie.

**De Bayle Des Hermens, R., Beucher, F., & Carbonnel, J. P.** ([s. d.]). Le Sahara atlantique à l'holocène, peuplement et écologie. (p. 340 + Bibliographie). Alger: Société Nationale d'Édition et de Diffusion.

**Elouard, P.** ([s. d.]). Oscillations climatiques de l'Holocène à nos jours en Mauritanie atlantique et dans la Vallée du Sénégal.

**Hebrard, H., Hugot, H. J., & Thilmans, G.** ([s. d.]). Données sur le néolithique de Nouaferd (Mauritanie). *In: Bulletin De L'IFAN*, série B, t. XXXII(3), 653-687.

**Institut Mauritanien De Recherche Scientifique .** ([s. d.]). Histoire du littoral atlantique saharien, quelques points de repère. (p. 16 + Bibl.). [s. l.]: [s. n.].

**Parc National du Banc d'Arguin.** ([s. d.]). Le Parc National du Banc d'Arguin : un site écologique exceptionnel, une interface désert-océan, siège d'une production biologique intense, d'une rare mais fragile beauté. Nouakchott: PNBA.

**Petit-Maitre, N.** ([s. d.]). Paléoenvironnement et peuplement holocènes du littoral mauritanien septentrional. (pp. 219-231). [s. l.]: [s. n.].

**Riser, J.** ([s. d.]). Quaternaire alluvial, éolien et littoral en Mauritanie : une riche trilogie. (pp. 127-139). [s. l.]: [s. n.].