

Kenya Annex I. Extended bibliography

The list below is a Word-readable export of the literature database developed for Kenya in Endnote. File attachments are not included due to copyright concerns, but they can be requested from the National Data and Information Coordinator.

Reference Type: Journal Article

Record Number: 529

Title: Shallow-marine sedimentary deposits - shelf, epeiric, neritic, epicontinental, Flandrian transgression, relict sediments, palimpsest sediments, lag gravel

Short Title: Shallow-marine sedimentary deposits - shelf, epeiric, neritic, epicontinental, Flandrian transgression, relict sediments, palimpsest sediments, lag gravel

URL:

<http://science.jrank.org/pages/48127/shallow-marine-sedimentary-deposits.html#ixzz0gGTgwXbD>

Reference Type: Report

Record Number: 590

Year: 1983

Title: The Antiquities and Monuments Act, 1983, Laws of Kenya

Publisher: G. P. Government of Kenya

Short Title: The Antiquities and Monuments Act, 1983, Laws of Kenya

'File' Attachments:

internal-pdf://ke_antiq&monuments1983_engorof-1632382464/ke_antiq&monuments1983_engorof.pdf

Reference Type: Book

Record Number: 573

Year: 1995

Title: Africa Data Sampler User's guide CD-ROM Version: A Geo-Referenced Database for All African Countries

Publisher: World Resources Institute

Pages: various pages

Short Title: Africa Data Sampler User's guide CD-ROM Version: A Geo-Referenced Database for All African Countries

Abstract: The ADS is an internationally comparable set of digital maps at a scale of 1:1 million for every country in Africa. The ADS is an integration of map data from several GIS databases. Roads, rivers, ... settlements, topography, and other essential base map features were extracted from the Arc/Info version of the Digital Chart of the World (ESRI, Redlands, CA). Data representing forests, wetlands, and protected areas from the Biodiversity Map Library (World Conservation Monitoring Center, Cambridge, UK), and sub-national boundaries and population estimates from the National Center for Geographic Information and Analysis (Santa Barbara,

CA) were integrated with the DCW data sets. Over twenty layers of data are available for most countries. The ADS comprises a CD-ROM and User's Guide. The CD-ROM contains digital maps in PC ARC/INFO format for 53 countries in Robinson projection, five sample views in ArcView 1 format for each country, and ARC/INFO Export files for all countries in geographic projection. The 150-page User's Guide is available in both English and French and gives detailed information on the ADS data sources, data quality, and applications. The Africa Data Sampler is available on CD-ROM usable in UNIX, MS-DOS, or Macintosh environments. The ADS CD is available for US179. Specify French or English User's Guide. Data sets for individual countries are also available on 3.5-floppy disk for US50.

Reference Type: Conference Paper

Record Number: 563

Year: 2008

Title: Resources for short courses in Integrated Coastal Zone Management ICZM

Conference Name: First Regional ICZM short course in Mauritius 19th -25th May 2008

'File' Attachments: internal-pdf://ICZM-3476002563/ICZM.pdf

Reference Type: Report

Record Number: 591

Year: 2009

Title: Draft Forest Policy, 2009

Publisher: G. o. K. Ministry of Forestry Resources

Short Title: Draft Forest Policy, 2009

Reference Type: Report

Record Number: 595

Author: M. o. F. D. (MoFD)

Year: 2009

Title: Ministry of Fisheries Development: Strategic plan for the period 2008-2012

Short Title: Ministry of Fisheries Development: Strategic plan for the period 2008-2012

Abstract: The fisheries resource base covers coastal and marine fisheries, inland fisheries, and aquaculture development. The current average fish production is 156,000 metric tons per year with inland fisheries contributing up to 93 % followed by marine fisheries 6 % and aquaculture 1 %(2007). Fish production grew by 4.6 % in 2007 and contributed 0.46 % to the National GDP (Economic Survey 2008). The fishery sub-sector is an important contributor to GDP and provides livelihoods to many Kenyans directly and indirectly and, therefore, needs to be managed through an explicit strategic plan which will give guidance and direction on sustainable development and utilization of the fisheries resources for the benefit of the present and future generations of the Kenyan people. The strategic plan presents programs that are crucial for the sub-sector's growth and development. These programs are; Aquaculture Development, promotion and utilization of fisheries resources, Fish Quality Assurance and

Value Addition, Fisheries Research, Development and exploitation of Kenya's 200 nautical miles EEZ off the Indian Ocean and ornamental and sport fishing, and infrastructure and human resources development. The strategic plan will be implemented through five broad based strategic objectives areas. Through the plan, a new organization structure for the ministry's technical department with new staffing levels has been proposed. The new posts of a fishery secretary and four functional directorates have been created as reflected in the ministerial organogram. The Ministry also has proposed a paradigm shift from the regional level approach to provincial and district level approach. By initiating these changes it is my hope that the delivery of service to the clients will improve tremendously. The implementation of the plan will be regularly monitored under a comprehensive monitoring and evaluation indicators developed as outlined in this strategic plan.

Reference Type: Conference Paper

Record Number: 526

Author: P. A. Abuodha

Year: 2003

Title: Sea level changes on the Kenyan coast during the quaternary period.

Conference Name: XVI INQUA Conference, session 92-Booth #66,

Pages: p 238

Abstract: Kenya is found on the African continent in the East bordering the Western Indian Ocean. The Kenya coast is approximately 600 km long from Kiunga in the north to Vanga in the south. Along the coast of Kenya, coastal terraces, dunes, cliffs and beach ridges are among the most important geomorphological features indicative of the Quaternary sea level changes. Coral reefs in coastal Kenya occur as fringing coral platforms, running parallel to the shoreline on the coastline. In other places the coral reefs occur as platforms on the intertidal flat and as backshore raised reef limestone, forming cliffs of 12- 15 m high. In Northern Kenya dune ridges are the main characteristics of the coast. Sometimes at least two generations of dune ridges can be found, the older probably being of young Pleistocene age, the younger closer to the sea of Holocene age. In the Southern Kenya, the coast becomes very complex. Cliffs formed by wave erosion in coral rocks with raised shorelines are the most prominent feature indicating a shoreline of emergence. However, where fresh water reaches the coast, deep creeks are found. Mangrove swamps are very common especially in muddy areas where fresh water enters the coast. Coastal terraces occur as distinctive platforms in stepwise manner in many places along the coast of Kenya. The terraces were cut during the Pleistocene to recent fluctuations in sea level. The beach ridges, closely associated with the dunes are of variable Holocene age. Coastal terraces that have been recognized by various workers are the Matuga surface (90-140 m), Chagamwe terrace (45-70 m), Ganda terrace (20-37 m), Kilifi terrace (15-18 m), Malindi terrace (7-10 m), Shelly beach terrace (4-5 m), Leven Reef terrace (0-2 m) and the submarine platforms at -5 and -15 m below datum. It has been assumed that the shore terraces of Kenya correspond to eustatic movements of sea level. However, if the dating were reasonably correct, the terraces would be found well below sea level if no rise of land had occurred during the time in question. Evidence of tectonic movements can be seen in the dipping of sedimentary strata on the coast in Kenya. It can therefore be concluded that the geomorphology of the Kenya

coast is not only as a result of sea level changes but also due to isostatic readjustments and tectonic movements.

URL: http://gsa.confex.com/gsa/inqu/finalprogram/abstract_52782.htm

Author Address: Kenya Marine and Fisheries Research Institute, P. O. Box 81651, Mombasa 80100 Kenya, pabuodha@yahoo.com.

Reference Type: Thesis

Record Number: 520

Author: P. A. W. Abuodha

Year: 1992

Title: Geomorphology and sedimentology of the Mombasa-Diani area: Implications for coastal zone management -

University: Univ. Nairobi,

Degree: Unpub. M.Sc. thesis,

Number of Pages: 155.

Short Title: Geomorphology and sedimentology of the Mombasa-Diani area: Implications for coastal zone management -

Keywords: Beach erosion

Beach profiles

Beach slope

Carbonate sediments

Coastal zone management

Environment management

Geomorphology

Grain size

Legislation

Man-induced effects

Sedimentology

Abstract: The overall objective of this thesis was to identify coastal zone management problems within the Mombasa-Diani area of Kenya. The study of sedimentology processes and geomorphic features have been used to suggest solution to these problems. Other objectives included evaluating the effectiveness of the existing control measures and identifying response strategies for the affected areas. The methods used were divided into field and laboratory methods. Sediments were investigated using grain size distribution analysis, carbonate content determination and microscopic study. Beach profiling, beach gradients and beach width measurements together with wave and current measurements and aerial photo interpretation facilitated the interpretation of geomorphic results. The results of sedimentological work showed erosional beaches occur at Kikambala, Kanamai, Mtwapa, Shanzu, Bamburi, Kenyatta and Black Cliff Point. Nyali, Tiwi, Galu and Kinondo were found to be stable beaches while Likoni, Diani and Gazi were considered depositional beaches given to induced erosion.

Geomorphologically, coastal dunes and beach ridges, cliffed coasts and backshore areas could be developed but with proper set back lines so as not to induce erosion. Coastal erosion, over development and lack of coastal zone management systems, and construction of stabilizing

structure along the beaches were identified as major problems within the project area. From these results it is concluded that there is an urgent need for development of a coastal zone management system and for enactment of a legislation which would protect coastal resources and environment for their sustainability. Stability structure should be constructed only for highly developed areas. Keeping in mind the future sea level rise, beach hotels should be put about 1 km landward of the shoreline.

'File' Attachments: internal-pdf://AbuodhaPAW_MSc-3409247488/AbuodhaPAW_MSc.pdf

Reference Type: Journal Article

Record Number: 575

Author: P. A. W. Abuodha and J. G. Kairo

Year: 2001

Title: Human-induced stresses on mangrove swamps along the Kenyan coast

Journal: Hydrobiologia

Volume: 458

Issue: 1-3

Pages: 255-265

Short Title: Human-induced stresses on mangrove swamps along the Kenyan coast

ISSN: 0018-8158 (Print) 1573-5117 (Online)

DOI: 10.1023/A:1013130916811

Keywords: deforestation - oil pollution - mangrove conversion - sustainable management - Kenyan coastline

Abstract: Mangroves form important ecosystems in Kenya's coastal areas. They produce goods and services that are of environmental, ecological and economic importance to human society. However, mangroves are under continuing pressure from anthropogenic disturbances. A particular concern has been the clearing of mangrove areas to reclaim land for other uses such as aquaculture, salt manufacture, agriculture and housing. About 10thinsp000 ha of mangrove areas have been cleared for salt manufacture between Ngomeni and Karawa, while in Lamu, close to 100 ha of mangrove forest was killed by dredged-up sediment that was deposited during the construction of the Mokowe sea jet. 100 ha of mangrove area have been converted for aquaculture at Ngomeni. At Gazi Bay, about 100 ha of mangrove forests was cleared for fuelwood and in Makupa Creek, Mombasa, 10 ha of mangroves died due to oil pollution. The total area lost is therefore 10thinsp310 ha which represents about 20% of the total mangrove forest. In this paper, deforestation, conversion of mangrove areas for other land uses and pollution of mangrove swamps on the Kenyan coast are discussed and a call for sustainable use, and the government policies that will enable this, is made.

'File' Attachments: <internal-pdf://Abuodha-0942515718/Abuodha.pdf>

Author Address: Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya

Reference Type: Journal Article

Record Number: 564

Author: R. S. Arthurton, A. H. Brampton, C. Z. Kaaya and S. K. Mohamed

Year: 1999

Title: Late Quaternary Coastal Stratigraphy on a Platform-Fringed Tropical Coast: A Case Study from Zanzibar, Tanzania

Journal: Journal of coastal research

Volume: 15

Issue: 3

Pages: 635-644

Short Title: Late Quaternary Coastal Stratigraphy on a Platform-Fringed Tropical Coast: A Case Study from Zanzibar, Tanzania

Alternate Journal: Journal Article

ISSN: 0749-0208

Keywords: Tanzania ; Zanzibar ; Indian Ocean ; upper Pleistocene ; Holocene ; stratigraphy ; cliffs ; platforms ; Weichselian ; limestone ; sand ; littoral erosion ; sea level ; climate modification ; paleoclimate ; shorelines ; corals ; reefs ; beaches ; longshore currents ; landform evolution ; East Africa ; Africa ; Pleistocene ; Quaternary ; Cenozoic ; Phanerozoic ; upper Quaternary ; carbonate rocks ; sedimentary rocks ; invertebrates ; Invertebrata ;

Abstract: The coasts of Zanzibar's islands, in common with those of the adjacent African mainland coast, are formed largely of Stage 5e Pleistocene limestones of back-reef facies. The limestones form typically undercut cliffs and associated wavecut platforms, commonly more than 1km wide. Where not masked by the deposits of beach ridge plains, the platforms coincide with the contemporary intertidal zone. This coincidence might suggest that the platforms are mid-late Holocene products, formed since the post-late-Weichselian glacial sea level attained its current highstand position. However, the present extremely slow rates of limestone cliff recession due to marine erosion, together with the existence, at the landward margin of the platform, of well lithified beach rocks of lithologies markedly different to those of the contemporary beach sands, indicate that most of the platform erosion occurred pre-Holocene. A sea-level stillstand period, following the peak of the Stage 5e highstand, is suggested. The overwashing of a pre-existing platform as a consequence of Holocene sea-level rise would have significantly and abruptly increased the area of intertidal to shallow subtidal habitats and thus the potential for the increased production of calcium carbonate sediment derived from that biota. The impact on the platform environment of predicted sea-level rise over the next century would be to create an extensive shallow subtidal environment promoting the growth of the calcareous green alga, *Halimeda*, coral mounds and small patch reefs. The beach ridge plains would become increasingly vulnerable to erosion.

Author Address: British Geological Survey Keyworth, Nottingham NG12 5GG, ROYAUME-UNI

Reference Type: Journal Article

Record Number: 521

Author: L. E. Ase

Year: 1978

Title: Preliminary report on studies of shore displacement at the southern coast of Kenya

Journal: Geografisker Annaler

Volume: 60A

Issue: 3-4

Pages: 209-221

Short Title: Preliminary report on studies of shore displacement at the southern coast of Kenya

'File' Attachments: internal-pdf://Ase-0188247552/Ase.pdf

Reference Type: Book Section

Record Number: 607

Author: S. O. Bandeira and G. F.

Year: 2003

Title: The seagrasses of Mozambique and southeastern Africa

Editor: G. E.P. and S. F.T.

Book Title: World Atlas of seagrasses

City: Berkeley and Los Angeles

Publisher: University of California Press

Pages: 93-100

Short Title: The seagrasses of Mozambique and southeastern Africa

Section: KENYA

Reference Type: Journal Article

Record Number: 519

Author: C. J. R. Braithwaite

Year: 1984

Title: Depositional History of the late Pleistocene; limestone of the Kenyan coast

Journal: Journal of the Geological Society

Volume: 141

Issue: 4

Pages: 685-699

Short Title: Depositional History of the late Pleistocene; limestone of the Kenyan coast

Abstract: The coastal limestones of Kenya extend approximately 180 km N-S from Malindi to the Tanzanian border. They are at least 20 m thick and may be subdivided into sedimentary units representing major periods of marine deposition punctuated by sub-aerial erosion. Their foundations are formed by thick fluvial and aeolian quartz sands but there is local evidence of marine deposition following these. In the main limestone unit, deposited about 240,000 years ago, initial high energy shallow-shelf deposition was replaced by quiet water sediments with scattered corals. Sea level stood about 8 m higher than at present. Quartzose sands were confined to western areas. A return to shallow water heralded a new phase of emergence and erosion, producing karst surfaces and sub-aerial sediments. These are overlain by herring-bone cross-bedded quartz-rich calcarenites which were the products of a tidally dominated shelf and, at Watamu and Wasini, pass upwards into aeolian dune deposits. However, these were also emerged and subject to karst erosion before deposition of a further widespread marine limestone. Within this, coral knolls are well developed. Much of the sediment accumulated in

shallow water, but the ecological succession indicates that knolls were at times in deeper waters. These deposits formed about 125,000 years ago when sea level ultimately stood 15–20 m above its present position. More recently in the area sea level has again fallen. However, the descent was not continuous and pauses were marked by marine terrace formation and subsequent karst erosion with sub-aerial deposition. Brief reversals caused both terraces and sediments to be overlain by thin marine deposits. Sea level paused at its present position about 30,000 years ago when the present reef platform was probably defined. It continued to fall to a maximum of about 120 m before rising to its existing level 7000 years ago and beginning the current cycle of sediment accumulation.

'File' Attachments:

internal-pdf://J_Geol_Soc_Lond_141_685[1]-3710557952/J_Geol_Soc_Lond_141_685[1].pdf

Reference Type: Journal Article

Record Number: 523

Author: W. Brakel

Year: 1984

Title: Seasonal dynamics of suspended-sediment plumes from the Tana and Sabaki rivers, Kenya: Analysis of Landsat imagery.

Journal: REMOTE SENSING ENVIRON

Volume: 16

Issue: 2

Pages: 165-173

Short Title: Seasonal dynamics of suspended-sediment plumes from the Tana and Sabaki rivers, Kenya: Analysis of Landsat imagery.

Keywords: imagery; remote sensing; river plumes; satellite sensing; seasonal variations; Kenya, Tana R.; LANDSAT

Abstract: Landsat imagery of the Kenya coast, in conjunction with meteorological, oceanographic, and river discharge data, was used to analyze coastal movement of suspended sediment from the Tana and Sabaki rivers. The distribution and relative concentration of suspended sediment in each image were mapped by tracing the perimeter of turbidity features visible at MSS bands 6, 5, and 4. Turbidity plumes appear seasonally, during and immediately following the two rainy seasons. Their subsequent movement is primarily affected by local wind and tide conditions. The largest sediment pulse, produced by the long rains in April-May, is transported north from the river mouths by prevailing southern monsoon winds and currents. The smaller sediment plumes generated by the short rains in November may be carried southward along the coast by weaker northern monsoon winds, despite the usual continued northward flow of the East African Coastal Current.

'File' Attachments: internal-pdf://Braker165-3742828288/Braker165.pdf

Reference Type: Journal Article

Record Number: 556

Author: I. Bryceson

Year: 1982

Title: Seasonality of oceanographic conditions and phytoplankton in Dar es Salaam waters

Journal: Univ. Sci. J. (Dar Univ.)

Volume: 8

Pages: 66-76

Short Title: Seasonality of oceanographic conditions and phytoplankton in Dar es Salaam waters

Reference Type: Book

Record Number: 583

Author: E. H. Buck and P. Folger

Year: 2009

Title: Ocean acidification

Series Title: CRS Report for Congress R40143

Short Title: Ocean acidification

Abstract: With increasing concentrations of carbon dioxide (CO₂) in the atmosphere, the extent of effects on the ocean and marine resources is an increasing concern. One aspect of this issue is the ongoing process whereby seawater becomes acidified (i.e., ocean acidification) as more CO₂ dissolves in it, causing hydrogen ion concentration in seawater to increase. Scientists are concerned that increasing hydrogen ion concentration could reduce growth or even cause death of shell-forming animals (e.g., corals, molluscs, and certain planktonic organisms) as well as disrupt marine food webs and the reproductive physiology of certain species. While not yet fully understood, the ecological and economic consequences of ocean acidification could be substantial. Scientists are concerned that increasing acidification could alter biogeochemical cycles, disrupt physiological processes of marine organisms, and damage marine ecosystems. This report does not discuss the effects of increasing thermal stress to marine organisms and ecosystems (e.g., coral bleaching) related to climate change. However, marine ecosystems are likely to be affected by the synergistic effects of factors involved in both thermal and acidification processes. Congress is beginning to focus attention on better understanding ocean acidification and determining how this concern might be addressed. In the 111th Congress, the Federal Ocean Acidification Research And Monitoring Act of 2009 (Title XII, Subtitle D, of P.L. 111-11) directed the Secretary of Commerce to establish an ocean acidification program within NOAA, established an interagency committee to develop an ocean acidification research and monitoring plan, and authorized appropriations through FY2012 for NOAA and the National Science Foundation.

'File' Attachments: internal-pdf://CNBP_023808-2990575617/CNBP_023808.pdf

Reference Type: Book

Record Number: 574

Author: S. A. Crafter, S. G. Njuguna and H. G. W. (Eds)

Year: 1992

Title: Wetlands of Kenya

Series Title: Proceedings of the KWWG seminar on wetlands of Kenya

City: National Museums of Kenya, Nairobi, Kenya

Publisher: IUCN Wetland Programme

Pages: viii 183 pp.

Short Title: Wetlands of Kenya

ISBN: 2-8317-0127-9

Reference Type: Journal Article

Record Number: 510

Author: F. Dahdouh-Guebas, E. Coppejans and D. Van Speybroeck

Year: 1999

Title: Remote sensing and zonation of seagrasses and algae along the Kenya

Journal: hydrobiologia

Volume: 400

Pages: 63-73

Type of Article: Journal Article

Short Title: Remote sensing and zonation of seagrasses and algae along the Kenya

'File' Attachments:

internal-pdf://Dahdouh-Guebas_F._et_al_(1999)-3517494528/Dahdouh-Guebas_F._et_al_(1999).pdf

Reference Type: Report

Record Number: 593

Author: M. o. F. Development

Year: 2009

Title: THE FISHERIES MANAGEMENT BILL, 2009

Series Title: Draft Fisheries Bill

Short Title: THE FISHERIES MANAGEMENT BILL, 2009

Abstract: Monitoring, control and surveillance (1) The Operator of each foreign fishing vessel issued a fishing license under this Act and such other fishing vessels or persons the Director-General may require shall; (a) Comply with monitoring, control and surveillance requirements for the operation of a vessel monitoring system in respect of the vessel and ensure that any information or data which may be required to be transmitted by an automatic location communicator is transmitted continuously, accurately and effectively to the designated receiver; (b) Provide such information relating to fishing or related activity, and to comply with the form, manner of reporting, time or frequency of reporting or other related requirement, pursuant to any fisheries management agreement or arrangement and to cooperate in the conservation, management and sustainable utilization and development of fisheries resources; (c) Comply with such other requirements as may be prescribed; (d) Certify that information provided pursuant to subparagraphs (a), (b) and (c) is true, complete and accurate;

Reference Type: Report

Record Number: 565

Author: R. N. Doue, N. Ochanda and H. Epp

Year: 1981

Title: A forest inventory using remote sensing technique.

Series Editor: D. o. R. S. Technical Report. Kenya Rangelands Ecological Monitoring Unit, Nairobi. Series No. 30.

Short Title: A forest inventory using remote sensing technique.

Reference Type: Journal Article

Record Number: 548

Author: J. M. Everaarts and J. Nieuwenhuize

Year: 1995

Title: Heavy metals in surface sediment and epibenthic macroinvertebrates from the coastal zone and continental slope of Kenya

Journal: Marine Pollution Bulletin

Volume: 31

Issue: 4-12

Pages: 281-289

Short Title: Heavy metals in surface sediment and epibenthic macroinvertebrates from the coastal zone and continental slope of Kenya

Abstract: In surface sediments, a statistically significant increase was measured in the concentration of copper and cadmium along all transects, and of zinc along only the most southern (Gazi) transect, radiating into the Indian Ocean perpendicular to the Kenyan coast. Mean copper and cadmium increased from 5 to 30 $\mu\text{g g}^{-1}$ dry wt and from 0.01 to 0.34 $\mu\text{g g}^{-1}$ dry wt in shallow coastal (± 20 m depth) to deep-sea stations (± 2000 m depth), respectively. These gradients were found both during the south-east monsoon and north-east monsoon period. The shallow estuarine zone of the Sabaki river mouth showed significantly enhanced levels of total organic carbon and nitrogen and all metals analysed, except cadmium. In crustaceans, the concentration of copper and particularly cadmium was significantly above baseline levels, varying from 45 to 90 $\mu\text{g g}^{-1}$ dry wt and 1.0 to 8.5 $\mu\text{g g}^{-1}$ dry wt, respectively. Zinc levels (49–102 $\mu\text{g g}^{-1}$ dry wt) were at about baseline levels or a little elevated. On the contrary, lead showed very low concentrations, varying from 0.1 to 0.6 $\mu\text{g g}^{-1}$ dry wt. Other species generally showed the same pattern.

'File' Attachments: <internal-pdf://EVERAARTS--3356516097/EVERAARTS-.pdf>

Author Address: Department of Chemical Oceanography and Marine Pollution, Netherlands Institute for Sea Research, P.O. Box 59, 1790 AB Den Burg-Texel, The Netherlands

Reference Type: Report

Record Number: 554

Author: W. Giesen and K. van de Kerkhof

Year: 1984

Title: The impact of river discharge on a Kenya coral reef ecosystem - the physical processes. 11. Effect on the Malind-Watamu coastal environment.

Series Title: Report to the Kenyan Office of the President, Nairobi

Short Title: The impact of river discharge on a Kenya coral reef ecosystem - the physical processes. 11. Effect on the Malind-Watamu coastal environment.

Reference Type: Report

Record Number: 589

Author: GK

Year: 2005

Title: Public Health Act (Laws of Kenya, Chapter 242)

Publisher: G. P. Government of Kenya

Short Title: Public Health Act (Laws of Kenya, Chapter 242)

Reference Type: Report

Record Number: 588

Author: GK

Year: 2007

Title: Occupational Health and Safety Act, 2007.

Publisher: G. P. Government of Kenya

Short Title: Occupational Health and Safety Act, 2007.

'File' Attachments:

internal-pdf://THE_OCCUPATIONAL_SAFETY_AND_HEALTH_BILL_vellum_rev-3309605120/THE_OCCUPATIONAL_SAFETY_AND_HEALTH_BILL_vellum_rev.pdf

Reference Type: Report

Record Number: 571

Author: goos

Year: 2006

Title: Understanding the role of the Indian Ocean in the climate system - Implementation Plan for sustained observations

Series Editor: C.-G. I. O. P. a. e. a. International CLIVAR Project Office

Series Volume: ICPO Publication Series, 100

Pages: 76pp.

Publisher: U. Southampton, International CLIVAR Project Office

Short Title: Understanding the role of the Indian Ocean in the climate system - Implementation Plan for sustained observations

Keywords: CLIVAR, GOOS, Indian Ocean, sustained observations, Indian

Abstract: The circulation and transport of heat in the Indian Ocean is unique in many respects, compared to the Pacific and the Atlantic. The Asian landmass blocks the ocean in the north so

that currents cannot carry tropical heat to higher latitude as the Atlantic and Pacific do. It also receives extra heat from the Pacific via the Indonesian Throughflow. The movement of heat around the ocean and exchange with the atmosphere is highly variable in time. As a consequence, the Indian Ocean plays a unique role in the variation of regional and global climate systems. The monsoon, or seasonal cycle, of southern Asia, East Africa and northern Australia interacts strongly with the Indian Ocean. Whereas the monsoon reversals of wind and rain recur each year, they do so with sufficient variability to create periods of relative drought and flood in large parts of the surrounding tropics, while teleconnections carry the climate anomaly into higher latitude regions on a global scale. The societal and economic impacts of these climate variations affect the lives of nearly two-thirds of the world's population. The benefit to be derived from describing, understanding and predicting the coupled ocean-atmosphere behaviour in this region is potentially huge, but limited at the present time by a lack of observational data on the ocean. The climate variations in the atmosphere are relatively well known due to the systematic collection of weather data on a global scale since World War 2. The related climate-processes in the ocean however are poorly documented, particularly in the Indian Ocean, where the development of the Global Ocean Observing System has lagged behind that of the Pacific and the Atlantic. This report is concerned with developing a rationale and a plan for implementation of sustained, basin-scale observations in this data-deficient region.

'File' Attachments: internal-pdf://IOP_Impl_Plan-2946855683/IOP_Impl_Plan.pdf

Reference Type: Journal Article

Record Number: 533

Author: H. G. H. Hamilton and W. H. Brakel

Year: 1984

Title: Structure and coral fauna of East Africa

Journal: Bull. Mar. Sci.

Volume: 34

Pages: 248-266

Short Title: Structure and coral fauna of East Africa

Abstract: The East African coast has over 140 known species of scleractinian corals belonging to 55 genera. The coral fauna and its partitioning into assemblages in response primarily to wave action are similar to that described for reefs of the Seychelles and Southern Maldivian Islands. Typical reef transects are described and drawn schematically. Exposed (windward) reef slopes show the development of spurs and grooves dominated by acroporids and pocilloporids in a turbulent upper zone, below which is a zone of massive poritids and faviids. Sheltered reef slopes tend to be steeper, less diverse, and are dominated by staghorn *Acropora* or by *Galaxea clavus*. The latter may form extensive monospecific reefs. On reef flats, *Pocillopora* and *Porites* are common, along with *Psammocora* and *Pavona*. The moat or lagoon behind the flat, where present, supports a more diverse mixed coral fauna. Contemporary reef growth appears to be vigorous on many reef edges and slopes, but increasing degradation of the coastal environment and overexploitation of reef resources threaten their continued development.

Reference Type: Journal Article

Record Number: 599

Author: C. Hedley

Year: 2008

Title: FAO Compliance Agreement' in International Fisheries Agreements

Journal: Vol. 1, section 1.3. (London: Ocean Law Publishing).

Short Title: FAO Compliance Agreement' in International Fisheries Agreements

'File' Attachments: internal-pdf://fao compliance agreement-2176740613/fao compliance agreement.pdf

Reference Type: Journal Article

Record Number: 572

Author: R. Hood, W. Naqvi, J. Wiggert, J. Goes, V. Coles, J. McCreary, N. Bates, P. K. Karuppasamy, N. Mahowald, S. Seitzinger and G. Meyers

Year: 2008

Title: Research Opportunities and Challenges in the Indian Ocean

Journal: EOS, TRANSACTIONS AMERICAN GEOPHYSICAL UNION

Volume: 89

Issue: 13

Pages: 125

Short Title: Research Opportunities and Challenges in the Indian Ocean

DOI: doi:10.1029/2008EO130001

Keywords: Biogeosciences: Biogeochemical cycles, processes, and modeling Biogeosciences: Climate dynamics Biogeosciences: Nutrients and nutrient cycling

Abstract: The Indian Ocean is a dynamically complex and highly variable system, with circulation features and biogeochemical properties that are unusual in many respects. Yet the Indian Ocean (IO) remains one of the most undersampled and least understood of the world's ocean basins. In this article, we define several outstanding research questions that need to be addressed in the IO related to ocean currents and variability, the controls and fate of primary production, global change and anthropogenic impacts, and the role of higher trophic levels in ecological processes and biogeochemical cycles. We also discuss a unique opportunity that has recently arisen for staging research in the IO.

'File' Attachments: internal-pdf://EOS_2008_Hood-1975589394/EOS_2008_Hood.pdf

Author Address: University of Maryland Center for Environmental Science, Cambridge, USA

Reference Type: Report

Record Number: 600

Author: IUCN

Year: 2000

Title: The IUCN Policy Statement on Sustainable Use of Wild Living Resources (Resolution 2.29)

adopted at the IUCN

Series Title: World Conservation Congress, Amman, October 2000:

Short Title: The IUCN Policy Statement on Sustainable Use of Wild Living Resources (Resolution 2.29) adopted at the IUCN

'File' Attachments:

internal-pdf://2000_oct_sust_use_of_wild_living_resources-0302203142/2000_oct_sust_use_of_wild_living_resources.pdf

Reference Type: Report

Record Number: 601

Author: IUCN

Year: 2003

Title: Protecting Marine Biodiversity and Ecosystem Processes through Marine Protected Areas beyond National Jurisdiction

Series Title: World Parks Congress 2003 Benefit Beyond Boundaries

City: Durban, South Africa

Short Title: Protecting Marine Biodiversity and Ecosystem Processes through Marine Protected Areas beyond National Jurisdiction

'File' Attachments: internal-pdf://MPATransboundary-3037033734/MPATransboundary.pdf

Reference Type: Book Section

Record Number: 582

Author: IUCN

Year: 2004

Title: Red tides & harmful algal blooms

Book Title: Managing marine protected areas: A toolkit for the Western Indian Ocean

Publisher: IUCN

Pages: H10

Short Title: Red tides & harmful algal blooms

Abstract: Red tides are natural and seasonal phenomena but some cause damage and are referred to as Harmful Algal Blooms (HABs). An MPA may never be directly affected by a red tide or HAB, but MPA personnel should be aware of this phenomenon, as they may be called upon to provide expertise in the case of a HAB elsewhere in the country.

'File' Attachments:

internal-pdf://H10_Red_tides_&_harmful_algal_blooms-1816056833/H10_Red_tides_&_harmful_algal_blooms.pdf

Reference Type: Book

Record Number: 522

Author: K. K. Kairu

Year: 1997

Title: Vulnerability of the Kenyan shoreline to coastal instability

Series Title: UNESCO-Kenya national seminar on sustainable coastal development through integrated planning and management focused on mitigating the impacts of coastline instability.

Publisher: UNESCO Reg. Off., Nairobi (Kenya)

Pages: 13-25

Short Title: Vulnerability of the Kenyan shoreline to coastal instability

Keywords: Coast defences; Coastal erosion; Coastal landforms; Coastal morphology; Coastal zone management; Geomorphology; Instability; Shore protection; Vulnerability; ISW, Kenya

Abstract: Kenya coastal zone has experienced rapid development and increase in human population. This has altered the environment and resulted in physical and ecological modification. In addition to influence by the different forcing factors, shoreline evolution is controlled by the coastal geology. Stable shorelines built from lithified beach rock and reef limestone are resistant to erosive forces, while low lying and unconsolidated shorelines are vulnerable to shoreline change. Three different coastal types are recognised along the Kenyan coast which include: the fringing reef shoreline of southern Kenya; the deltaic shorelines of Sabaki and the Tana River delta area; and the ancient delta area of the Lamu Archipelago. Coastal erosion has been recognised at different localities in all the three coastal types. Its occurrence is controlled by the coastal setting and the geology. Coastal zone development in the last 30 years has not appreciated the problem of coastal erosion. Extensive coastal infrastructure is sited on low lying recent coastal settings vulnerable to shoreline change. To protect coastal investment and beaches from continued erosion, there is need to develop new guidelines to manage the coastal zone. Such guidelines must take note of the dynamic nature of coastal environments, natural shore evolution, future development on river systems and the projected sea level trends.

'File' Attachments: <internal-pdf://138391eo-2386887936/138391eo.pdf>

Reference Type: Journal Article

Record Number: 539

Author: J. N. Kamau

Year: 2001

Title: Heavy metals distribution in sediments along the Kilindini and Makupa Creeks, Kenya

Journal: Hydrobiologia

Volume: 458

Issue: 1-3

Pages: 235-240

Short Title: Heavy metals distribution in sediments along the Kilindini and Makupa Creeks, Kenya

Keywords: heavy metals - Kilindini creek - Makupa creek - distribution

Abstract: Makupa creek is connected to the Indian Ocean via the Killindini creek; the study deals with the distribution of heavy metals in the Makupa and Killindini creeks. Concentrations of Cu, Cd, Fe and Zn, in sediments at the inner sections of the creeks were high compared to those measured at Likoni (ocean). Considering trace metal levels at the inner sections relative to Likoni the ratios obtained, were Cd 7:1, Cu 13:1, Fe 5:1 and Zn 21:1. The results obtained

point at Makupa creek as the main source of heavy metals into the creek system, however iron behaved differently, it was significantly higher at the Killindini Harbour $P < 0.05$ (at 95% confidence level). There was a decline in concentrations of, copper and zinc from the inner stations to the frontwater zone at Makupa creek. Spatial variations of cadmium were not significant between inner and frontwater zones of the Makupa creek $P > 0.05$ (at 95% confidence level), and also between Makupa and Harbour. There was however a significant difference $P < 0.05$ (at 95% confidence level) between Likoni and Makupa.

'File' Attachments: internal-pdf://Kamau2-2299704833/Kamau2.pdf

Author Address: Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya

Reference Type: Journal Article

Record Number: 594

Author: K. Kelleher

Year: 2002

Title: The Costs of Monitoring, Control and Surveillance of Fisheries in Developing

Journal: FAO Fisheries circular

Date: 47pp

Short Title: The Costs of Monitoring, Control and Surveillance of Fisheries in Developing

Keywords: Control methods , Costs , Developing countries , Fisheries development , Fishery management , Fishery policies , Monitoring , Surveying

Abstract: This report is a preliminary effort to establish the nature and range of costs of monitoring, control and surveillance in developing countries. Definitions of MCS and key terms used are provided and the methodology used in the study is stated. Several of the major factors determining the structure of MCS systems are characterized and the principal capital and recurrent costs identified and quantified, using examples from a range of countries. The problem of estimating the benefits arising from MCS is addressed and approaches to determining and financing an adequate set of MCS activities presented.

Reference Type: Report

Record Number: 598

Author: Kensea

Year: 2007

Title: THE KENSEA II PROJECT Tsunami Damage Projection for the Coastal Area of Kenya

Series Title: Draft Final Report

Document Number: INT/03/R11 Fund for Danish Consultancy Services: UNOPS case file: 04 KEN 1181

Short Title: THE KENSEA II PROJECT Tsunami Damage Projection for the Coastal Area of Kenya

Abstract: A tsunami is a special kind of sea wave, in which large amounts of sea water are travelling from the source across the deep ocean. And even if the wave motion is no higher than ½-1 meter in the deep ocean it is magnified near the coasts, especially in fiords, bays and

river estuaries. The worst cases of height of the waves near the beach may reach tens of meters, and run-up is even larger. The tsunami wave with its transport of water masses is different from the more common wave phenomena, in which the water particles are just waving up and down, but not transported over large horizontal distances.

'File' Attachments:

internal-pdf://FINAL_Draft_REPORT_040607--1766027781/fINAL_Draft_REPORT_040607-.pdf

Reference Type: Report

Record Number: 549

Author: Kenya

Year: 2002

Title: 1999 population and housing census the popular report.

Institution: Central Bureau of Statistics, Ministry of Finance and Planning in Nairobi, Kenya .

Short Title: 1999 population and housing census the popular report.

Reference Type: Report

Record Number: 545

Author: J. U. Kitheka

Year: 2002

Title: Dry season sediment fluxes in the front water zone of the mangrove-fringed Mwache-creek Kenya

Series Title: In: Arthurton, R.S. H.H. Krener, Odada, E., Solomons, W. and Marshall, J.I. Crossland (eds). African basins: LOICZ Global change assessment and synthesis of river catchment- Coastal sea interaction and human dimensions

Series Volume: LOICZ Reports and Studies No. 25; ii + 344p. LOICZ, Texel, The Netherlands

Pages: 194-209

Short Title: Dry season sediment fluxes in the front water zone of the mangrove-fringed Mwache-creek Kenya

'File' Attachments: internal-pdf://report25-3441011200/report25.pdf

Reference Type: Report

Record Number: 546

Author: J. U. Kitheka

Year: 2002

Title: The Tana River basin and the opportunity for research on the land-ocean interaction in the Tana Delta.

Series Title: In: Arthurton, R.S. H.H. Krener, Odada, E., Solomons, W. and Marshall, J.I. Crossland (eds). African basins: LOICZ Global change assessment and synthesis of river catchment- Coastal sea

Pages: 203-209

Short Title: The Tana River basin and the opportunity for research on the land-ocean

interaction in the Tana Delta.

'File' Attachments: <internal-pdf://report25-1444557568/report25.pdf>

Reference Type: Journal Article

Record Number: 557

Author: J. U. Kitheka, B. M. Mwashote, B. O. Ohowa and J. Kamau

Year: 1999

Title: Water circulation, groundwater outflow and nutrient dynamics in Mida creek, Kenya

Journal: Mangroves and Salt Marshes

Volume: 3

Issue: 3

Pages: 135-146

Short Title: Water circulation, groundwater outflow and nutrient dynamics in Mida creek, Kenya

ISSN: 1386-3509 (Print) 1572-977X (Online)

DOI: DOI 10.1023/A:1009912124709

Keywords: coastal management - groundwater - mangroves - nutrients - water circulation

Abstract: The relationship between physical hydrodynamic processes and nutrients dynamics was investigated in Mida creek, a groundwater influenced mangrove fringed creek in Kenya between March 1996 and May 1997. The research involved spot and time series measurement of nitrate–nitrite, ammonia, silicates, phosphates, salinity, temperature, sea level as well as tidal currents at seven stations located in the front, middle and backwater zones of the creek. Groundwater level as well as total dissolved solids" concentration, salinity, temperature and nutrients" concentration were also measured once every month in shallow wells (water table < 5 m) located in the upper region of the creek. Results of the study show that nutrient concentrations vary with the tide and that, though there is no river drainage, they are of the same magnitude as in mangrove creeks with substantial river runoff. The peak concentrations of $\text{NH}_4^+ - \text{N}$ (5.45 M), $\text{NO}_2^- - \text{NO}_3^-$ (5.63 M), $\text{PO}_4^{3-} - \text{P}$ (0.58 M) and $\text{SiO}_3^{2-} - \text{Si}$ (81.36 M) in the creek occurred during flood tide, 2–3 h before high waters. The $(\text{NO}_2^- + \text{NO}_3^-) - \text{N}$ concentrations declined rapidly during ebb tide, reaching the minimum levels during low water. Contribution of groundwater seepage to the net nutrients flux (particularly on nitrite–nitrates) is largest in dry seasons. The study shows that groundwater outflow sustains the mangroves during periods of severe salinity stress and nutrients deficiency in dry seasons. This is essentially by limiting salinity increase and by boosting nutrient supply in dry seasons.

'File' Attachments: internal-pdf://Kitheka135_146-0621077505/Kitheka135_146.pdf

Author Address: Kenya Marine and Fisheries Research Institute (KMFRI), P.O. Box 81651, Mombasa, Kenya

Reference Type: Journal Article

Record Number: 544

Author: J. U. Kitheka, M. Obiero and P. Nthenge

Year: 2005

Title: River discharge, sediment transport and exchange in the Tana Estuary, Kenya

Journal: Estuarine, Coastal and Shelf Science

Volume: 63

Issue: 3

Pages: 455-468

Short Title: River discharge, sediment transport and exchange in the Tana Estuary, Kenya

Keywords: river discharge; sediment concentration; sediment flux; tidal exchange; tidal current velocities; monsoon; Tana River Estuary; Kenya

Abstract: This study focuses on sediment transport and exchange dynamics in the 27 km² Tana Estuary located at Kipini in the north Kenya coast. The estuary is drained by the Tana River, which contributes more than 50% of the total river discharges into the Kenyan sector of the Indian Ocean. The study involved measurement of river discharges, estuarine flood–ebb tidal discharges, total and particulate organic suspended sediment concentrations (TSSC, POSC) and fluxes, tidal water elevation, current velocities, temperature and salinity. The study was conducted between February 2001 and November 2003. The results of the study showed that the Tana River discharge ranged between 60 and 750 m³ s⁻¹. The maximum river discharges during the Southeast and Northeast monsoons were 750 and 350 m³ s⁻¹, respectively. The peak river discharges occurred in May and November. The total daily sediment load of the Tana River varied from 2796 tons day⁻¹ during the dry season to 24,322 tons day⁻¹ during the rainy season. The annual total sediment load is 6.8 × 10⁶ tons yr⁻¹, which is, however, smaller than that before the damming of the river in the Upper Tana Basin. Because of river discharge and occurrence of a wide mangrove wetland, the estuary is mainly ebb tide dominant. The peak ebb tide currents (0.87 m s⁻¹) were 30% larger than the peak flood tide currents (0.65 m s⁻¹). During spring tide, the estuary was partially well mixed. However, in neap tide, the estuary was stratified in the middle zone. The turbidity maximum zone with TSSC > 1.5 g l⁻¹ was generated in spring tide by wave stirring of frontwater zone bed sediments and trapping of fine sediments at the toe of the salt wedge. The peak TSSC ranging from 1.5 to 5.0 g l⁻¹ occurred at low tide due to river supply of sediment and resuspension of channel bed sediments by wind waves, particularly at the last stages of ebb tide and early stages of flood tide. Due to the influx of oceanic water into the estuary at flood tide TSSC decreased to <0.2 g l⁻¹ at high tide in the frontwater zone and was larger in the backwater zones of the estuary. The estuary exports sediments at a rate ranging from 0.02 to 0.08 kg m⁻² tidal cycle⁻¹. The net export of sediments causes a net denudation of the estuary at a rate ranging from 0.08 to 0.04 mm tidal cycle⁻¹.

'File' Attachments: internal-pdf://Kitheka455-1181196800/Kitheka455.pdf

Author Address: Ecology and Environmental Research Programme, Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya

Reference Type: Journal Article

Record Number: 559

Author: J. U. Kitheka, B. O. Ohowa, B. M. Mwashote, W. S. Shimbira, J. M. Mwaluma and J. M. Kazungu

Year: 1996

Title: Water circulation dynamics, water column nutrients and plankton productivity in a

well-flushed tropical bay in Kenya

Journal: Journal of Sea Research

Volume: 35

Issue: 4

Pages: 257-268

Short Title: Water circulation dynamics, water column nutrients and plankton productivity in a well-flushed tropical bay in Kenya

Keywords: tropical bay; tidal flushing; freshwater input; nutrient distribution; plankton productivity

Abstract: Water circulation, water column nutrients and plankton productivity were studied in a tropical bay with high rates of water exchange (60% to 90% per tide) and short residence times (3 to 4 h). The water circulation is predominantly affected by the semi-diurnal tides, which cause strong and reversing currents in the mangrove creeks ($0.60 \text{ m}\cdot\text{s}^{-1}$) and currents of low magnitude in the neighbouring seagrass and coral reef zones ($< 0.30 \text{ m}\cdot\text{s}^{-1}$). Tidal asymmetry, with relatively stronger ebb than flood flows in the mangrove creeks, promotes the net export of nutrients from the river mouth and of organic matter from the mangroves to the seagrass beds. The main sources of the dissolved inorganic nutrients are two rivers (the Kidogoweni and Mkurumuji) which discharge (up to $17.0 \text{ m}^3\cdot\text{s}^{-1}$) in the upper and lower regions of the bay. The increased input of nutrients did not cause eutrophic conditions since nutrients were rapidly flushed out of the bay. The mangrove biotope generated small amounts of dissolved nutrients which are likely to be used for primary production within the mangrove zone. The production of nutrients in the mangrove zone was masked by high rates of flushing, such that no appreciable nutrient signal was detected in the dry season when the influence of the rivers diminished. The rates of primary production were low in the mangrove, seagrass, and coral reef biotopes in the dry season. Primary production increased slightly during the rainy season. The level of chlorophyll a in the mangrove biotope increased during ebb tides and decreased during flood tides. The highest zooplankton densities, which could not be related directly to primary production in the water-column, occurred at the seagrass station during the wet season.

'File' Attachments: <internal-pdf://Kitheka96-1976435716/Kitheka96.pdf>

Author Address: Kenya Marine and Fisheries Research Institute (KMFRI), P. O. Box 81651, Mombasa, Kenya

Reference Type: Journal Article

Record Number: 543

Author: J. U. Kitheka, G. S. Ongwenyi and K. M. Mavuti

Year: 2003

Title: Fluxes and exchange of suspended sediment in tidal inlets draining a degraded mangrove forest in Kenya

Journal: Estuarine, Coastal and Shelf Science

Volume: 56

Issue: 3-4

Pages: 655-667

Short Title: Fluxes and exchange of suspended sediment in tidal inlets draining a degraded mangrove forest in Kenya

Keywords: Mangrove wetland; Inlet; Total suspended sediment concentration; Ebb–flood tidal discharge; Sediment fluxes; Sedimentation; Net sediment import and export

Abstract: This study focuses on sediment exchange in the degraded Mwache mangrove forest wetland located in southern Kenya. It involved measurement of total and particulate organic suspended sediment concentrations (TSSC and POSC), tidal water elevation and current velocities. Results showed that in the heavily degraded backwater zone mangrove forest, the ebb and flood tide total sediment fluxes were of same order of magnitude, however, flood tide sediment fluxes were slightly higher than the ebb ones. In the moderately degraded frontwater zone mangrove forest, the flood tide sediment fluxes were more than 50% higher than the ebb tide fluxes. The peak net sedimentation in the highly degraded backwater zone was $4 \text{ g m}^{-2} \text{ tide}^{-1}$ but that in the moderately degraded frontwater zone was $63 \text{ g m}^{-2} \text{ tide}^{-1}$. In the frontwater zone of the mangrove forest, the peak instantaneous ebb tide sediment flux was $3206 \text{ kg tide}^{-1}$ equivalent to $35.6 \text{ g m}^{-2} \text{ tide}^{-1}$ and the flood one $8574 \text{ kg tide}^{-1}$ ($95 \text{ g m}^{-2} \text{ tide}^{-1}$). The peak instantaneous flood and ebb tide particulate organic sediment (POS) fluxes in the frontwater zone mangrove forest were $1316 \text{ kg tide}^{-1}$ ($15 \text{ g m}^{-2} \text{ tide}^{-1}$) and 587 kg tide^{-1} ($6.5 \text{ g m}^{-2} \text{ tide}^{-1}$), respectively. The peak ebb and flood tide sediment fluxes in the backwater mangrove forest were $3206 \text{ kg tide}^{-1}$ ($36 \text{ g m}^{-2} \text{ tide}^{-1}$) and $3305 \text{ kg tide}^{-1}$ ($36.7 \text{ g m}^{-2} \text{ tide}^{-1}$), respectively. In case of POS fluxes in the backwater zone mangrove forest, the peak flood period POS flux was 969 kg tide^{-1} ($10.7 \text{ g m}^{-2} \text{ tide}^{-1}$) while the ebb period one was 484 kg tide^{-1} ($5.4 \text{ g m}^{-2} \text{ tide}^{-1}$). In both highly degraded backwater and moderately degraded frontwater zone of the mangrove forest, there is net import of sediments. However, the net import is relatively lower in the backwater zone forest where the trapping efficiency is 27%. In the moderately degraded frontwater zone of the mangrove forest, the sediment trapping efficiency is 65%. The net sediment import occurs mainly in periods of high river discharge in both neap and spring tides, but occurs only in spring tides during dry season. The net accretion rates in the backwater and frontwater zone mangrove forests are 0.25 and 3.5 cm year^{-1} , respectively.

'File' Attachments: <internal-pdf://JUKitheka655-0034709761/JUKitheka655.pdf>

Author Address: Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya

Reference Type: Report

Record Number: 532

Author: KMFRI

Title: Draft report prepared for the Food and Agriculture Organisation, Kenya Marine and Fisheries Research Institute, Mombasa.

Short Title: Draft report prepared for the Food and Agriculture Organisation, Kenya Marine and Fisheries Research Institute, Mombasa.

Reference Type: Journal Article

Record Number: 535

Author: J. O. Kokwaro

Year: 1985

Title: The distribution and economic importance of the mangrove forests of Kenya

Journal: Journal of the East Africa Natural History Society and National museum

Volume: 75

Pages: 1-10

Short Title: The distribution and economic importance of the mangrove forests of Kenya

Abstract: The mangroves form a group of higher plants which form a unique ecosystem, in that they grow in that part of land which is neither in demand for human settlement nor for agricultural use. They are also unique in their adaptation to both soil and water conditions. They are useful as a source of timber, for building poles, fuel, dyes, tannins, and are also known to provide both shelter and food for part of the marine fauna. Their value to the country, therefore, calls for proper utilization and conservation of all the available mangrove forests along the coast. The demand for forest products, including those from the mangroves in Kenya, is greater than the available resources from the forests, and unless proper and prompt planning for their protection is implemented our mangroves will soon be among the endangered ecosystems in the country.

'File' Attachments: <internal-pdf://Kokwaro188-0924083969/Kokwaro188.pdf>

Author Address: Department of Botany, University of Nairobi

Reference Type: Journal Article

Record Number: 605

Author: J. Kromkamp, M. De Bie, N. Goosen, J. Peene, P. Van Rijswijk, J. Sinke and G. C. A. Duineveld

Year: 1997

Title: Primary production by phytoplankton along the Kenyan coast during the SE monsoon and November intermonsoon 1992 and the occurrence of *Trichodesmium*

Journal: Deep-Sea Research

Volume: 44

Pages: 1195–1212

Short Title: Primary production by phytoplankton along the Kenyan coast during the SE monsoon and November intermonsoon 1992 and the occurrence of *Trichodesmium*

Abstract: Phytoplanktonic primary production was measured during the SE monsoon in June–July and during the intermonsoon period in November–December 1992. Primary production was highest on the northernmost transect during the SE monsoon, whereas during the intermonsoon it was highest on the southernmost transect. In general primary production was higher during the intermonsoon, and highest productivity was measured along the southern coast of Kenya. The more stable hydrodynamical conditions during the intermonsoon period promoted the occurrence of the nitrogen-fixing cyanobacterium *Trichodesmium*, primarily at the shallower stations. Nitrogen fixation assays suggested that this cyanobacterium was responsible for most of the new production. Comparison between net primary productivity, bacterial productivity and benthic respiration suggests that rates of primary production should

be higher than measured, implying that primary production can be as high as that in tropical upwelling systems, despite the fact that a regular and well-developed upwelling period does not always seem to occur.

Author Address: Netherlands Institute for Sea Research, P.O. Box 59, NL 1790 AB Den Burg, The Netherlands

Reference Type: Journal Article

Record Number: 517

Author: J. O. Lalah, P. O. Yugi, I. O. Jumba and S. O. Wandiga

Year: 2003

Title: Organochlorine pesticide residues in Tana and Sabaki Rivers in Kenya.

Journal: Bull. Environ. Contam. Toxicol.

Volume: 71

Pages: 298-307.

Short Title: Organochlorine pesticide residues in Tana and Sabaki Rivers in Kenya.

'File' Attachments: internal-pdf://Lalah-3943152384/Lalah.pdf

Reference Type: Journal Article

Record Number: 550

Author: W. Macnae

Year: 1968

Title: A general account of the fauna and flora of mangrove swamps and forests in the Indo-West-Pacific Region

Journal: Advances in Marine Biology

Volume: 6

Pages: 73-270.

Short Title: Adv. Mar. Biol.

Reference Type: Journal Article

Record Number: 567

Author: A. J. Mafimbo and C. J. C. Reason

Year: 2010

Title: Air-sea interaction over the upwelling region of the Somali coast.

Journal: JOURNAL OF GEOPHYSICAL RESEARCH

Volume: 115

Short Title: Air-sea interaction over the upwelling region of the Somali coast.

DOI: doi:10.1029/2009JC005439

Abstract: During the southwest monsoon, two upwelling cells are established along the Somali coast, around 4°N–5°N and 10°N. The sea surface temperatures (SSTs) over these regions can fall to about 22°C on average during this time. Using satellite-derived data, the covariability in wind and SST is examined for the months of June–August 2005, a particularly strong upwelling

season. In July 2005, when a strong localized upwelling event occurred near 4°N–5°N, the Somali Jet, which establishes itself along the coast during June–August, was found to have oscillated at a frequency of about 4–8 weeks. High covariability in mesoscale winds and SSTs were found over the upwelling region. The observed covariability of wind and SSTs is argued to be the result of SST modulation of the atmospheric stability such that over warm temperatures, the unstable atmosphere brings down high winds, and over cold temperatures, the stable atmosphere decelerates the surface winds. These SST-induced changes in the lower atmosphere lead to changes in wind stress divergence and a dipole in wind stress curl across the cold filament with negative (positive) curl upstream (downstream) of the cold tongue.

Author Address: Department of Oceanography, University of Cape Town, Rondebosch, South Africa

Reference Type: Report

Record Number: 551

Author: D. Malleret-King, A. King, S. Mangubhai, J. Tunje, J. Muturi, E. Mueni and H. On'ganda

Year: 2003

Title: FMSP project R8196: Understanding fisheries associated livelihoods and the constraints to their development in Kenya and Tanzania-review of marine fisheries for Kenya. Unpublished project report: DFIT.

Short Title: FMSP project R8196: Understanding fisheries associated livelihoods and the constraints to their development in Kenya and Tanzania-review of marine fisheries for Kenya. Unpublished project report: DFIT.

Reference Type: Journal Article

Record Number: 524

Author: T. R. McClanahan and D. Obura

Year: 1997

Title: Sedimentation effects on shallow coral communities in Kenya

Journal: Journal of Experimental Marine Biology and Ecology

Volume: 209

Issue: 1-2

Pages: 103-122

Short Title: Sedimentation effects on shallow coral communities in Kenya

Keywords: algae; coastal waters; community composition; coral reefs; corals; ecological distribution; environmental factors; land use; river discharge; river flow; sedimentation; soil erosion

Abstract: Since the early 1960s increased soil erosion due to changing land-use practices in the Sabaki River catchment basin, has increased river-sediment discharge into coastal waters around Malindi, Kenya. Line transect surveys of shallow (<5 m at low tide) coral reef communities were conducted in 1985-1988 and 1992-1993 on a gradient of sediment influence in the Watamu (low influence) and Malindi (intermediate and high influence) National Marine Parks. Total algal cover increased between surveys only at the control (low sediment)

reef, to levels comparable to the sediment influenced reefs. Within algal categories (turf, calcareous, fleshy and coralline) there were no consistent differences among treatment groups consistent with sediment influence. Soft coral and sponge cover were higher at increasing levels of sediment influence, though this trend is confounded by a parallel increase in water motion. Coral cover increased significantly over time at the intermediate reef, to levels comparable to the low and high-sediment influenced reefs. Generic richness, diversity and dominance of corals were broadly similar among all reefs except for higher dominance in the control reef. Positive correlation between differences in coral genus abundance and differences in mean coral colony sizes over time and among reefs suggests a suite of sediment-tolerant (*Echinopora*, *Galaxea*, *Hydnophora*, *Millepora* and *Platygyra*) and sediment-intolerant (*Favia*, *Montipora* and *Pocillopora*) genera. *Acropora*, *Astreopora*, *Favites* and *Porites* were intermediate between these groups. Reefs exposed to high sediment influence were dominated by sediment tolerant and intermediate coral genera during both surveys, while reefs exposed to low sediment influence were dominated by sediment-intolerant and intermediate genera. Overall, although there were changes in some of the parameters listed above, and in coral genus abundance patterns, no evidence for decreased diversity and ecological health of sediment-influenced reefs could be found for our set of community-level measurements of the shallow-water coral assemblage.

'File' Attachments: <internal-pdf://McClahanan-1997-3172469760/McClahanan-1997.pdf>

Reference Type: Book Section

Record Number: 560

Author: D. A. McGill

Year: 1973

Title: Light and nutrients in the Indian Ocean

Editor: B. Zeitschel and S. A. Gerlach

Book Title: The biology of the Indian Ocean

Publisher: Springer Verlag, Berh,

Volume: Vol. 3.

Pages: p 53-102

Short Title: Light and nutrients in the Indian Ocean

'File' Attachments:

[internal-pdf://Biology_Indian_Ocean\[1\]-1776002308/Biology_Indian_Ocean\[1\].pdf](internal-pdf://Biology_Indian_Ocean[1]-1776002308/Biology_Indian_Ocean[1].pdf)

Reference Type: Report

Record Number: 592

Author: F. D. Ministry of Fisheries Development

Year: 2009

Title: National Oceans and Fisheries Policy 2008

Pages: 41pp

Short Title: National Oceans and Fisheries Policy 2008

Abstract: To develop the Ocean fisheries, the Ministry will reserve and manage capacity of the

inshore fisheries for the local investors, and proactively encourage development of deep sea and the EEZ through joint venture between the local and foreign investors. The Ministry will continue to license the Distant Water Fishing Nations (DWFN) and enter into partnership agreements while encourage local fishers to form joint ventures and build capacity for investment and skills. The provision of a fishing port will enable the country to enforce the port state measures which require that all licensed DWFN fishing in the EEZ must dock at the ports state and leave a quota of the landed fish. This will encourage the expansion of the fish processing and service industries thus creating employment opportunities for the locals and revenue for the government. To fight the Illegal, Unreported and Unregulated fishing (IUU), the joint Monitoring, Control and Surveillance Unit (MCS) will coordinate all other agencies to have frequent patrols. To be able to discharge these patrols, the capacity of the Navy needs to be expanded and strengthened to be able to give protection to the unit. Peace along the Kenyan waters will encourage the investors to venture into deep sea fishing.

Reference Type: Journal Article

Record Number: 516

Author: J. C. Mugachia, L. Kanja and T. E. Maitho

Year: 1992

Title: Organochlorine pesticide residues in estuarine fish from the Athi River, Kenya.

Journal: Bulletin of Environmental Contamination and Toxicology

Volume: 49

Issue: 2

Pages: 199-206

Short Title: BULL. ENVIRON. CONTAM. TOXICOL.

Keywords: bioaccumulation; freshwater fish; pesticides; pollution effects

Abstract: Studies of organochlorine pesticide residues in Kenyan fish have previously been focused mainly on Lake Victoria and the Great Rift Valley lakes. The present study was done to investigate organochlorine pesticide residue levels in fish from the estuary of Athi River. The main objective of the study was to identify and quantify organochlorine residues in the fish so as to assess the extent of contamination of the river by the pesticides and evaluate the toxicological significance of the findings.

'File' Attachments: internal-pdf://Mugachia-1141128448/Mugachia.pdf

Reference Type: Report

Record Number: 512

Author: A. Munga, A. C. Yobe, D. Owili and A. E. Mwangi

Year: 1994

Title: Assessment of land-based sources of marine pollution along the Kenyan coast

Series Title: Draft report prepared for the Food and Agriculture Organisation,

Publisher: M. Kenya Marine and Fisheries Research Institute and F. a. A. Organisation

Short Title: Assessment of land-based sources of marine pollution along the Kenyan coast

Reference Type: Thesis

Record Number: 511

Author: D. Munga

Year: 1985

Title: DDT and endosulfan residues in fish from Hola Irrigation Scheme, Tana River, Kenya

University: University of Nairobi

Degree: MSc thesis

Short Title: DDT and endosulfan residues in fish from Hola Irrigation Scheme, Tana River, Kenya

Keywords: Chemical pollutants; DDT; Freshwater pollution; Metabolites; Pesticides; Pollution effects; Article Taxonomic Terms: *Clarias mossambicus*; *Labeo gregorii*; *Oreochromis mossambicus*; *Tilapia zillii*; Kenya, Tana R.

Abstract: The levels of concentration of residues of the organochlorine pesticides DDT and its principal metabolites DDE and DDD, and endosulfan and its metabolite endosulfan sulphate were investigated in fish from the Hola irrigation scheme, in the Lower Tana river basin (Kenya), where the pesticides were used for the control of cotton and maize pests. Endosulfan was applied on cotton by aerial spraying, whereas DDT was applied on cotton by aerial spraying or dusted on maize. Four fish species were studied for residues of the organochlorine pesticides, namely, *Clarias mossambicus* (Peters), *Labeo gregorii* (Boulenger), *Oreochromis mossambicus* (Trewavas), and *Tilapia zilli* (Gervais), caught from sampling sites within the irrigation scheme, and the Tana River itself. The concentrations of residues found in fish tissues are discussed with reference to the influence of several factors, namely, the body mass, fat content, location of the sampling site within and without the irrigation scheme, the fish species and type of tissue or organ. The concentrations of the pesticide residues in muscle tissue showed better correlation with fat mass or content, than with wet body mass of fish samples. Hence, it is recommended that residue concentrations of organochlorine pesticides, such as DDT and endosulfan, which are lipophilic, should be expressed in fat mass basis for fair comparisons of residue levels between fish species to be made. The concentration of residues in fish samples varied according to the distance of the sampling site from the cotton fields, with fish from the closest site being the most contaminated. Fish samples from the Tana River itself were found to be the least contaminated with pesticide residues. Of the four fish species studied, *C. mossambicus*, a bottom feeding species had the highest concentration of residues in muscle tissue at 0.4 mg kg^{-1} wet mass (241 mg kg^{-1} fat mass) of capital sigma DDT (p,p'-DDT + p,p'-DDE + p,p'-DDD), and 0.11 mg kg^{-1} wet mass (23.2 mg kg^{-1} fat mass) of capital sigma endosulfan (endosulfan I + endosulfan II + endosulfan sulphate). The liver of *L. gregorii*, having higher fat content than eggs and muscle tissue, had comparatively higher levels of pesticides residues. A different relationship was shown by the levels in residues between the different tissues for *C. mossambicus*. High concentrations of capital sigma DDT residues were found in eggs (2834 mg kg^{-1} fat mass/ 17.6 mg kg^{-1} wet mass) and liver (146 mg kg^{-1} fat mass/ 9.8 mg kg^{-1} wet mass) of some samples of *C. mossambicus*, which were potential causes of reproduction failure and physiological aberrations of the liver.(DBO)

Reference Type: Report

Record Number: 608

Author: D. Munga, S. Mwangi, J. Kamau, M. M. Nguli, P. O. Gwada, L. N. Daudi, H. Ong'anda, S. M. Mwanguni, H. S. Massa, M. Tole, J. M. Onyari, J. Makopa, A. Gachanja, G. Opello, A. Kheir and S. Machua

Year: 2006

Title: Land-based activities, pollution sources and levels in water and sediment in the coastal and marine area of Kenya

City: Mombasa, Kenya

Institution: Kenya Marine & Fisheries Research Institute

Short Title: Land-based activities, pollution sources and levels in water and sediment in the coastal and marine area of Kenya

Abstract: Kenya has a land area of 580,000 km² and lies astride the equator. It has a coastline bordering the Indian Ocean, which runs about 600 km long in a south-westerly direction with varying, marine and coastal wetlands rich in biodiversity. The coastline is characterised by a fringing coral reef broken at places where rivers discharge and estuarine creeks open into the sea. The estuaries are typically fringed with highly productive and extensive mangrove swamps. In the nearshore areas between the mangroves and fringing coral reef are lagoons that harbour highly productive and diverse seagrass meadows. These ecosystems receive considerable quantities of riverine and coastal watershed discharge which include high loads of nutrients, sediments, suspended particulate matter, heavy metals and petroleum hydrocarbons associated with municipal wastewater and agricultural runoff that impact on the water and sediment quality, productivity, biodiversity and system functioning. It is recognized that the systems are multiple use ecosystems providing various goods and services of ecological and socio-economic significance. It is instructive that major urban and commercial centres have developed around such marine systems. Indeed coastal and marine resources are under relentless pressure from rapid population growth and urbanization. Thus, about 9 % of the total population of Kenya is based in the Coast Province and growing at 3.1 % p.a. which is significantly faster than the national average of 2.9 % p.a.

'File' Attachments: internal-pdf://Kenya National Pollution Status Report-2-3608096256/Kenya National Pollution Status Report-2.pdf

Author Address: Kenya Marine & Fisheries Research Institute, P.O. Box 81651, 80100 - Mombasa, Kenya. E-mail: dmunga@kmfri.co.ke

Reference Type: Book Section

Record Number: 538

Author: D. Munga, S. Mwangi, H. Ong'anda, J. U. Kitheka, S. M. Mwanguni, F. Mdoe, J. Barongo, H. S. Massa and G. Opello

Year: 2006

Title: Vulnerability and Pollution of Groundwater in Kisauni, Mombasa, Kenya

Book Title: In Y. Xu and B. Usher (eds) Groundwater Pollution in Africa

Publisher: UNEP

Pages: 213-228.

Short Title: Vulnerability and Pollution of Groundwater in Kisauni, Mombasa, Kenya

Keywords: Environmental legislation; Environmental protection; Groundwater pollution; Pollution control; Resource management; Urbanization; Waste water; Water; Water pollution; Water quality control; Water resources; Water supply; Water use regulations; ISW, Kenya, Coast, Mombasa

Abstract: Rapid urbanisation in the Mombasa District (Kenya), and in particular the Kisauni area, has increased the demand for essential services, notably water supply and waste management infrastructure. This is manifested in inadequate clean drinking water from the reticulated supply, leaving the inhabitants with groundwater to supplement their resources, or in most cases as the sole option. An assessment of the intrinsic aquifer vulnerability to contamination was carried out by applying the DRASTIC model coupled with GIS analytical tools. Monitoring data on physico-chemical characteristics showed raised concentrations of nitrates in groundwater, in particular, in the more densely populated Kisauni areas, attributed to contamination from on-site sanitation systems dominated by pit latrines and septic tank-soak pit systems and uncollected municipal refuse concentrations of $\text{NO}_3^{-1}/\text{NO}_2^{-1}\text{-N}$ ranged from 0.4 to 44.4 mg l^{-1} , with an indication of seasonal variations. About 50% and 70% of the water samples tested in June/July and November, respectively, did not exceed the 10 mg l^{-1} $\text{NO}_3^{-1}/\text{NO}_2^{-1}\text{-N}$ guideline level set for potable water by WHO. The Kisauni area is indicated as experiencing a high degree of groundwater contamination by microbial contaminants, especially in the high-density housing settlements, attributed to on-site sanitation. The contamination levels are more severe during the rainy season, when aquifer recharge is high. A suggested strategy for intervention includes the control of pollution sources, education and awareness creation, and the implementation of existing laws and regulations to protect and manage groundwater resources.

'File' Attachments: [internal-pdf://Groundwater Pollution in Africa-2628438277/Groundwater Pollution in Africa.pdf](#)

Reference Type: Report

Record Number: 552

Author: D. Munga, S. Mwangi, H. Ong'anda, J. U. Kitheka, S. M. Mwanguni, F. Mdoe, J. Barongo, H. S. Massa and G. Opello

Year: 2009

Title: Pollution and vulnerability of water supply aquifers in Mombasa Kenya

Pages: 32

Publisher: UNEP

Short Title: Pollution and vulnerability of water supply aquifers in Mombasa Kenya

URL: www.unep.org/groundwaterproject/Archives/Kenya-midReport.pdf

'File' Attachments: [internal-pdf://Kenya-midReport-0677552896/Kenya-midReport.pdf](#)

Reference Type: Report

Record Number: 609

Author: S. N. Mwangi

Year: 1997

Title: Microbial water quality in and Diani areas.

Series Title: Anthropogenically induced changes in groundwater outflow and quality, and the functioning of Eastern African nearshore ecosystems (GROFLO).

Document Number: Contract No. IC18-CT96-0065, First Annual Progress Report of the INCO Project:

Pages: 19-28.

Short Title: Microbial water quality in and Diani areas.

Reference Type: Journal Article

Record Number: 537

Author: B. M. Mwashote

Year: 2003

Title: Levels of Cadmium and Lead in Water, Sediments and Selected Fish Species in Mombasa, Kenya

Journal: Western Indian Ocean J. Mar. Sci.

Volume: 2

Issue: 1

Pages: 25-34

Short Title: Levels of Cadmium and Lead in Water, Sediments and Selected Fish Species in Mombasa, Kenya

Keywords: heavy metals, cadmium, lead, water, sediment, fish, Kenya coast

Abstract: Flame absorption spectrophotometry was used to investigate the concentration and distribution of cadmium and lead in water, sediments and selected fish species in Makupa and Tudor creeks in Mombasa, Kenya between May 1997 and March 1998. The results were compared with those obtained in relatively less anthropogenically influenced areas along the Kenyan coast. The mean concentrations for Pb ranged from not detectable (nd) to 0.012 mg/l, 0.2 to 58.0 mg/kg and nd to 59.3 mg/kg in water, sediment and fish samples respectively. Cadmium concentrations in water were generally below detection limits, while in sediment and fish samples, they ranged from nd to 1.0 mg/kg and nd to 3.7 mg/kg respectively. Overall, Pb and Cd concentrations were low in the water column of Makupa and Tudor creeks, with a few incidents of elevated levels in sediments and some fish species, especially during the rainy season. Makupa creek had the higher levels overall. The levels of Pb and Cd in most of the fish species analysed were generally within acceptable limits by FAO standards.

'File' Attachments: internal-pdf://Mwashote-1142235905/Mwashote.pdf

Author Address: Kenya Marine and Fisheries Research Institute, P. O. Box 81651 Mombasa, Kenya

Reference Type: Journal Article

Record Number: 558

Author: B. M. Mwashote and I. O. Jumba

Year: 2002

Title: Quantitative aspects of inorganic nutrient fluxes in the Gazi Bay (Kenya): implications for

coastal ecosystems

Journal: Marine Pollution Bulletin

Volume: 44

Issue: 11

Pages: 1194-1205

Short Title: Quantitative aspects of inorganic nutrient fluxes in the Gazi Bay (Kenya): implications for coastal ecosystems

Keywords: Gazi bay; Nutrient sources; Benthic fluxes; Fluvial discharge; Community production; Coastal ecosystems

Abstract: Fluxes of dissolved inorganic nutrients: NH_4^+ , NO_2^- , NO_3^- , PO_4^{3-} and Si(OH)_4 from nearshore sediments of Gazi Bay were measured in situ within mangrove, seagrass and coral reef biotopes using benthic flux bell-jar chambers of cross-sectional area 0.066 m^2 and volume 0.0132 m^3 . The objectives were: (1) to determine the influence of benthic fluxes, fluvial discharge and seasonal variations on the nutrient budget in the Bay waters; (2) to determine the effect of tidal and spatial variations on nutrient loads in the water column and (3) to establish the relative importance of the nutrient sources with regard to total community production of the Bay. The directly measured fluxes ranged from -270 to $+148 \mu\text{mol NH}_4^+-\text{N}/\text{m}^2/\text{h}$; -60 to $+63 \mu\text{mol NO}_2^--\text{N}/\text{m}^2/\text{h}$; -79 to $+41 \mu\text{mol NO}_3^--\text{N}/\text{m}^2/\text{h}$; -79 to $+75 \mu\text{mol PO}_4^{3--}\text{P}/\text{m}^2/\text{h}$ and $+30$ to $+350 \mu\text{mol Si(OH)}_4-\text{Si}/\text{m}^2/\text{h}$ for and respectively. It was established that benthic fluxes are the major sources of dissolved inorganic NH_4^+ , NO_2^- and Si(OH)_4 while fluvial sources are important for NO_3^- and PO_4^{3-} into Gazi Bay waters. Seasonal variations had an appreciable effect on the PO_4^{3-} fluxes, N:Si ratio, river nutrient discharge, plankton productivity and important environmental factors such as salinity and temperature. Tidal and spatial variations had no significant effect on nutrient concentrations and net fluxes within the water column. The results imply that benthic fluxes are largely responsible for the nutrient dynamics of the nearshore coastal ecosystems especially where direct terrestrial inputs do not contribute significantly to the nutrient budget.

'File' Attachments: [internal-pdf://Mwashote1-3255159041/Mwashote1.pdf](#)

Author Address: Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya

Reference Type: Conference Paper

Record Number: 527

Author: R. R. Nair

Year: 1973

Title: Holocene Sea-levels on the western continental shelf of India, National Institute of Oceanography.

Conference Name: Proceedings of the Indian Academy Sciences B

Conference Location: India

Volume: 79

Pages: 197-203

Date: 1973

'File' Attachments:

internal-pdf://Proc_Indian_Acad_Sci_B_79_197[1]-2063992320/Proc_Indian_Acad_Sci_B_79_197[1].pdf

Reference Type: Report

Record Number: 586

Author: NEMA

Year: 1999

Title: EMCA Part VI, Section 58-62: Environmental Management and Coordination Act, 1999, Government of Kenya

Publisher: G. Printer

Short Title: EMCA Part VI, Section 58-62: Environmental Management and Coordination Act, 1999, Government of Kenya

'File' Attachments: internal-pdf://env_mgt_act-1566063104/env_mgt_act.pdf

Reference Type: Report

Record Number: 587

Author: NEMA

Year: 2003

Title: EMCA (Environmental Management and Coordination Act)

Publisher: G. P. Government of Kenya

Short Title: EMCA (Environmental Management and Coordination Act)

Reference Type: Report

Record Number: 584

Author: NEMA

Year: 2010

Title: Draft ICZM Policy: National Environment Management Authority (NEMA)

Publisher: G. Printer

Short Title: Draft ICZM Policy: National Environment Management Authority (NEMA)

Reference Type: Report

Record Number: 585

Author: NEMA

Year: 2010

Title: ICZM-NPA: National Environment Management Authority (NEMA),

Publisher: G. Printer

Short Title: ICZM-NPA: National Environment Management Authority (NEMA),

Reference Type: Journal Article

Record Number: 555

Author: B. S. Newell

Year: 1957

Title: A preliminary survey of the hydrography of the British East African coastal waters.

Journal: Fish. Publ. Lond.

Issue: 9

Pages: 1-21

Short Title: A preliminary survey of the hydrography of the British East African coastal waters.

Reference Type: Report

Record Number: 610

Author: B. M. Nyonje

Year: 1997

Title: Seasonal Variation in algal population and Species Composition in Ngomeni Creek and Adjacent tide-fed Solar Saltworks

Series Title: WIOMSA/ MARG-I/1997/02.

Document Number: WIOMSA/ MARG-I/1997/02.

Pages: 34pp

Short Title: Seasonal Variation in algal population and Species Composition in Ngomeni Creek and Adjacent tide-fed Solar Saltworks

Reference Type: Journal Article

Record Number: 534

Author: C. A. Ochieng and P. L. A. Erftemeijer

Year: 2002

Title: Phenology, litterfall and nutrient resorption in *Avicennia marina* (Forssk.) Vierh in Gazi Bay, Kenya

Journal: Trees

Volume: 16

Pages: 167-171

Short Title: Phenology, litterfall and nutrient resorption in *Avicennia marina* (Forssk.) Vierh in Gazi Bay, Kenya

Keywords: Africa ; Kenya ; Mangrove ; Hardwood forest tree ; Spermatophyta ; Angiospermae ; Dicotyledones ; Verbenaceae ; *Avicennia marina* ; Biogeochemical cycle ; Resorption ; Distribution ; Nutrient ; Plant leaf ; Turnover ; Seasonal variation ; Litter ; Development ;

Abstract: The phenology and litterfall of the mangrove *Avicennia marina* were monitored from August 1993 to November 1994 in Gazi Bay, Kenya. Phenological trends in the emergence and fall of leaves were monitored at regular intervals from 200 tagged terminal shoots distributed over 34 different trees randomly selected within three sites in a monospecific stunted *A. marina* stand. Litterfall data were collected using 23 litter traps randomly distributed in the same stand. The results showed a marked seasonality in leaf emergence in *A. marina* with a peak of 1.61 ± 0.34 leaves per leaves present day⁻¹ during the rainy season. Most litterfall was

recorded at the beginning of the dry season. Average total litterfall amounted to 6.2 ± 4.7 ton ha⁻¹ year⁻¹ with leaves contributing up to 83% of the total. Peak leaf emergence preceded peak leaf fall by approximately 1 month. Trees produced most new leaves when there were optimal conditions of runoff (nutrients), low evapotranspiration and reduced salinity during the rainy season. The average leaf longevity observed in the present study was approximately 11 months (1.1 turnover per year). Analysis of leaves of different physiological ages showed a nutrient resorption in the *A. marina* stand of 68% for N and 61% for P. Chloride content did not change with the ageing of leaves.

Reference Type: Journal Article

Record Number: 536

Author: E. Z. Ochieng, J. O. Lalah and S. O. Wandiga

Year: 2009

Title: Anthropogenic Sources of Heavy Metals in the Indian Ocean Coast of Kenya

Journal: Bull Environ Contam Toxicol

Volume: 83:600-607

Short Title: Anthropogenic Sources of Heavy Metals in the Indian Ocean Coast of Kenya

Keywords: water, surface sediment, rivers, heavy metals, Indian Ocean, Kenya, enrichment factors

Abstract: Water and surface sediment samples from Rivers Sabaki, Ramisi and Vevesi that flow into the Indian Ocean coast of Kenya were analysed for heavy metals. The sediment concentrations of exchangeable cations (in microg/g) for Co, Cu, Mn, Ni, Pb, Sn and Zn ranged from 0.10 to 506.75 (for Mn at Sabaki), constituting between 2% and 20% of the total metal concentrations obtained by digestion with strong acid. Cu, Mn, Ni, Pb and Zn were more leachable with 0.1 N HCl. The total dissolved metal in water and the total sediment concentrations for Ag, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sn and Zn are given in the text. For dissolved metals, the metal/Mn ratios indicated higher concentrations of Ag in Sabaki River, Cd in Ramisi, Ni in Sabaki and Pb in Ramisi, respectively. In sediments, the metal/Mn ratios showed higher enrichment of Ag in Ramisi, Cd in Sabaki and Vevesi, and Zn in Sabaki, respectively. Enrichment factors showed elevated levels of Cd, Pb and Zn in sediment in River Sabaki and River Vevesi that were due to anthropogenic inputs through Athi River. The total dissolved metal concentration ranges for the three rivers were comparable with those ranges reported in rivers in South Africa but the sediment concentrations were below those of rivers in Europe and Asia where anthropogenic addition of some of the toxic elements such as Cu, Pb and Cd is evidently higher.

'File' Attachments: [internal-pdf://Ochieng heavy metals-0888129810/Ochieng heavy metals.pdf](internal-pdf://Ochieng%20heavy%20metals-0888129810/Ochieng%20heavy%20metals.pdf)

Author Address: Department of Chemistry, College of Biological and Physical Sciences, University of Nairobi, P.O. Box 30197, Nairobi, Kenya.

Reference Type: Journal Article

Record Number: 561

Author: L. J. Ogallo, J. E. Janowiak and M. S. Halpert

Year: 1988

Title: Teleconnection between seasonal rainfall over East Africa and global sea surface temperature anomalies

Journal: Journal of the Meteorological Society of Japan JMSJAU

Volume: 66

Pages: 807-821

Type of Article: Journal Article

Short Title: J. Meteor. Soc. Japan

Keywords: Climatology | Meteorology | Rainfall | Africa | Water temperature | Seasonal variation | Sea surface temperature | Statistical analysis

Abstract: Global sea surface temperature (SST) anomalies within ± 30 degrees latitude of the equator were correlated with the time series of the major rotated principal component analysis (RPCA) modes of the seasonal rainfall over East Africa (Kenya, Uganda, and Tanzania) for the period from 1950 to 1979. Regionally averaged rainfall anomalies were also correlated with the SST anomalies. The physical reality and climatological stability of the computed correlations were investigated using 6 degree by 6 degree gridmesh SST records instead of the optimal 2 degree by 2 degree values. The stability of the patterns were further tested by random removal of a maximum of up to five pairs of the SST and rainfall records from the original data sets. The results from the study indicate significant instantaneous (zero lag) and time lagged correlations between SST anomalies over portions of the global oceans and some of the principal seasonal rainfall modes in East Africa. The maximum instantaneous correlations occur in the boreal autumn between SST anomalies in the Pacific Ocean and the autumn rainfall RPCA mode, which is dominant over the coastal regions. The spatial patterns of the significant correlations indicate a 'see-saw' pattern between the eastern Pacific Ocean and the Indonesia region which coincides with positive rainfall anomalies over the coastal regions of East Africa, and indicates a relationship between rainfall variability in this region and the El Nino/Southern Oscillation (ENSO) phenomena. Lower spatial and temporal persistence is observed between SST anomalies and the rainfall RPCA modes that dominate inland. The maximum variance of the seasonal rainfall that could be accounted for by the SST anomalies was about 40%.

Reference Type: Book

Record Number: 579

Author: E. Okemwa, M. J. Ntiba and K. E. Sherman

Year: 1995

Title: Status and Future of Large Marine Ecosystems of the Indian Ocean. A Report of the International symposium and workshop. A Marine Conservation and Development report

City: IUCN, Switzerland

Pages: 201 pp.

Short Title: Status and Future of Large Marine Ecosystems of the Indian Ocean. A Report of the International symposium and workshop. A Marine Conservation and Development report

'File' Attachments: internal-pdf://LME10001-1160414982/LME10001.pdf

Reference Type: Journal Article

Record Number: 604

Author: N. J. P. Owens, J. Priddle and M. J. Whitehouse

Year: 1991

Title: Variations in phytoplankton nitrogen assimilation around South Georgia and in the Bransfield Strait (Southern Ocean)

Journal: Marine Chemistry

Volume: 35

Pages: 287–304

Short Title: Variations in phytoplankton nitrogen assimilation around South Georgia and in the Bransfield Strait (Southern Ocean)

Legal Note: KENYA

Abstract: Nitrogen assimilation was measured in two austral summers in the Scotia Sea around the island of South Georgia as well as the Bransfield Strait. Nitrate and ammonium assimilation was measured using ^{15}N techniques and the population was divided into two size classes, less than and greater than $20\ \mu\text{m}$. Water column integrated nitrogen assimilation rates varied between 2.43 and $26.50\ \text{mmol N m}^{-2}\ \text{day}^{-1}$, the distribution being highly heterogeneous. The highest assimilation rate was found at a station near South Georgia, where the chlorophyll standing stock was elevated. A high assimilation rate was observed at a station in the Bransfield Strait and was associated with a localised, shallow mixed-layer feature. The less than $20\ \mu\text{m}$ size fraction contributed to a variable but frequently significant proportion of the total assimilation (14–78%). f ratios were generally low, signifying a high dependence of the population on ammonium as a nitrogen source. Small phytoplankton exhibited a statistically significant greater preference for ammonium than large species, and the total community f ratio was influenced strongly by the proportion of the less than $20\ \mu\text{m}$ fraction and ammonium concentration. It is suggested that nutrients may play a more important role in the ecology of the phytoplankton in the Southern Ocean than is usually supposed.

Author Address: Plymouth Marine Laboratory, Prospect Place, The Hoe, Plymouth PL1 3DH, UK

Reference Type: Book Section

Record Number: 580

Author: P. A. Raal and L. Barwell

Year: 1998

Title: Application of integrated environmental management toward solving the problems affecting the Tana River Delta and its linkage with the Somali current ecosystem

Editor: K. e. O. Sherman, EN (ed); Ntiba, MJ (ed)

Book Title: Large marine ecosystems of the Indian Ocean: Assessment, sustainability, and management.

Pages: 343–351

Short Title: Application of integrated environmental management toward solving the problems affecting the Tana River Delta and its linkage with the Somali current ecosystem

ISBN: 0632043180

Keywords: Brackishwater environment; Coastal zone management; Deltas; Environment management; Fishery resources; Rivers; Socioeconomic aspects; Sociological aspects; Water currents; ISW, Indian Ocean, Somali Current; ISW, Kenya, Coast, Tana Delta

Abstract: The Tana River delta is an important link to the Indian Ocean ecosystem in terms of its contribution to the Kenya fishery resource. However, the system is experiencing considerable adverse environmental impact because of sociopolitical and economic factors that are jeopardizing its survival as an estuary. The main issue directly affecting the ecosystem is the damming of the river and the redirecting of the river flow, which limits the flow of freshwater into the estuary and therefore the potential of the estuary to provide a breeding and nursery area for marine biota. The development of an integrated management strategy for the Tana River delta has been identified as a priority. The Division of Earth, Marine, and Atmospheric Science and Technology of the South African Council for Scientific and Industrial research has submitted a proposal to the National Environment Secretariat of Kenya to manage a multidisciplinary integrated environmental management (IEM) project in which the entire system (river, estuarine, and marine) will be investigated so that all issues contributing to problems in the delta can be elucidated. The aim of this study is to compile a detailed management plan for the Tana River Delta so that both the human needs and those of the environment, including the marine and estuarine components, are satisfactorily met on a sustainable basis. An important objective of the study is to transfer knowledge of IEM procedure and methodology, which have been developed in South Africa, to the Kenyan authorities.

Reference Type: Report

Record Number: 581

Author: ReCoMaP

Year: 2007

Title: Regional Programme for the sustainable management of the coastal zones of the Indian Ocean countries : ReCoMaP DVD

Series Editor: M. Proceedings of Strategic Planning Workshop for Integrated Coastal Zone Management in Kenya March 1st, Kenya

City: Mombasa, Kenya

Institution: Kenya Marine and Fisheries Research Institute

Short Title: Regional Programme for the sustainable management of the coastal zones of the Indian Ocean countries : ReCoMaP DVD

Reference Type: Journal Article

Record Number: 566

Author: G. Sætersdal, G. Bianchi, T. Strømme and S. C. Venema

Year: 1999

Title: The DR. FRIDTJOF NANSEN Programme 1975–1993. Investigations of fishery resources in developing countries. History of the programme and review of results

Journal: FAO Fisheries Technical Paper

Issue: 391

Pages: 434p

Short Title: The DR. FRIDTJOF NANSEN Programme 1975–1993. Investigations of fishery resources in developing countries. History of the programme and review of results

Abstract: This document provides a review of practically all the surveys carried out with the research vessel “Dr. Fridtjof Nansen” from 1975 to the middle of 1993 in the Indian, Atlantic and Pacific Oceans. Complete lists of all surveys carried out by this R/V, and reports produced and of scientific staff participating in the surveys are provided as annexes. Chapter 2 provides an overview of survey methodology and also describes the development in the acoustic equipment used and associated problems. Particular emphasis is placed on the surveys carried out in the Arabian Sea, supplemented by a review of surveys carried out by the sister ship “Rastrelliger” off Southwest India. The results of the first surveys of the “Dr. Fridtjof Nansen” are revised on the basis of the latest knowledge of acoustic equipment and properties and consequently many results of the earlier surveys have been sized down. Other areas covered are: the Bay of Bengal off Bangladesh and Myanmar, sea areas around peninsular Malaysia and areas off western Thailand and Indonesia; the Southwest Indian Ocean; the Atlantic Ocean off Northwest Africa, Southwest Africa, with special emphasis on surveys off Angola and Namibia and the shelf area between Suriname and Venezuela; shelf areas in the Pacific Ocean between Southern Mexico and Colombia. The R/V Dr. Fridtjof Nansen has provided some of the best groundtruthing of the rough estimates of the potential resources first published by FAO in 1970. In Chapter 10 the survey results are compared with those early guesses and estimates based on acoustic and trawl surveys of the productivity per unit area of small pelagic and demersal fish are provided. The results of the surveys have also been used for analyses of demersal fish assemblages, reviewed in the various chapters by area and in Chapter 10 and for the production of a number of FAO Fish Identification Sheets and Field Guides, of which the references are given in Chapter 11.

URL: <http://www.fao.org/DOCREP/004/X3950E/X3950E00.HTM>

Reference Type: Report

Record Number: 530

Author: P. Saoke

Year: 2005

Title: Fostering Active and Effective Civil Society Participation in Preparations for Implementation of the Stockholm Convention: Kenya POPs Situation Report: DDT, Pesticides and Polychlorinated Biphenyls Physicians for Social Responsibility (PSR) - Kenya. The International POPs Elimination Project (IPEP)

Short Title: Fostering Active and Effective Civil Society Participation in Preparations for Implementation of the Stockholm Convention: Kenya POPs Situation Report: DDT, Pesticides and Polychlorinated Biphenyls Physicians for Social Responsibility (PSR) - Kenya. The International POPs Elimination Project (IPEP)

Reference Type: Journal Article

Record Number: 606

Author: F. T. Short and H. A. Neckles

Year: 1999

Title: The effects of global climate change on seagrasses

Journal: Aquatic Botany

Volume: 63

Pages: 169–196

Short Title: The effects of global climate change on seagrasses

Legal Note: KENYA

Keywords: Seagrass; Climate; Greenhouse effect; Global warming; Carbon dioxide; UV radiation; Sea level rise; Eelgrass; Macrophyte

Abstract: The increasing rate of global climate change seen in this century, and predicted to accelerate into the next, will significantly impact the Earth's oceans. In this review, we examine previously published seagrass research through a lens of global climate change in order to consider the potential effects on the world's seagrasses. A primary effect of increased global temperature on seagrasses will be the alteration of growth rates and other physiological functions of the plants themselves. The distribution of seagrasses will shift as a result of increased temperature stress and changes in the patterns of sexual reproduction. Indirect temperature effects may include plant community changes as a result of increased eutrophication and changes in the frequency and intensity of extreme weather events. The direct effects of sea level rise on the coastal oceans will be to increase water depths, change tidal variation (both mean tide level and tidal prism), alter water movement, and increase seawater intrusion into estuaries and rivers. A major impact of all these changes on seagrasses and tidal freshwater plants will be a redistribution of existing habitats. The intrusion of ocean water into formerly fresh or brackish water areas will directly affect estuarine plant distribution by changing conditions at specific locations, causing some plants to relocate in order to stay within their tolerance zones and allowing others to expand their distribution inland.

Distribution changes will result from the effects of salinity change on seed germination, propagule formation, photosynthesis, growth and biomass. Also, some plant communities may decline or be eliminated as a result of increased disease activity under more highly saline conditions. Increased water depth, which reduces the amount of light reaching existing seagrass beds, will directly reduce plant productivity where plants are light limited. Likewise, increases in water motion and tidal circulation will decrease the amount of light reaching the plants by increasing turbidity or by stimulating the growth of epiphytes. Increasing atmospheric carbon dioxide will directly elevate the amount of CO₂ in coastal waters. In areas where seagrasses are carbon limited, this may increase primary production, although whether this increase will be sustained with long-term CO₂ enrichment is uncertain. The impact of increases in CO₂ will vary with species and environmental circumstances, but will likely include species distribution by altering the competition between seagrass species as well as between seagrass and algal populations. The reaction of seagrasses to UV-B radiation may range from inhibition of photosynthetic activity, as seen for terrestrial plants and marine algae, to the increased metabolic cost of producing UV-B blocking compounds within plant tissue. The effects of UV-B radiation will likely be greatest in the tropics and in southern oceans. There is every reason to believe that, as with the predicted terrestrial effects of global climate change, impacts to

seagrasses will be great. The changes that will occur in seagrass communities are difficult to predict; our assessment clearly points out the need for research directed toward the impact of global climate change on seagrasses.

Author Address: Department of Natural Resources, University of New Hampshire, Jackson Estuarine Laboratory, 85 Adams Point Road, Durham, NH 03824, USA

Reference Type: Journal Article

Record Number: 568

Author: D. R. Sikka and G. S.

Year: 1980

Title: On the maximum cloud zone and the ITCZ over India longitude during the Southwest monsoon

Journal: Mon. Weather Rev.

Volume: 108

Issue: 11

Pages: 1840-1853

Type of Article: JOURNAL ARTICLE

Short Title: On the maximum cloud zone and the ITCZ over India longitude during the Southwest monsoon

DOI: <http://ams.allenpress.com/perlserv/?request=get-ab...>

Abstract: An investigation is presented of the daily variation of the maximum cloud zone (MCZ) and the 7W mb trough in the Northern Hemisphere over the Indian longitudes 70–90°E during April–October for 1973–77. It is found that during June–September there are two favorable locations for a MCZ over these longitudes—on a majority of days the MCZ is present in the monsoon zone north of 15°N, and often a secondary MCZ occurs in the equatorial region (0–10°N). The monsoon MCZ gets established by northward movement of the MCZ occurring over the equatorial Indian ocean in April and May. The secondary MCZ appears intermittently, and is characterized by long spells of persistence only when the monsoon MCZ is absent. In each of the seasons studied, the MCZ temporarily disappeared from the mean summer monsoon location (15–28°N) about four weeks after it was established near the beginning of July. It is reestablished by the northward movement of the secondary MCZ, which becomes active during the absence of the monsoon MCZ, in a manner strikingly similar to that observed in the spring to summer transition. A break in monsoon conditions prevails just prior to the temporary disappearance of the monsoon MCZ. Thus we conclude that the monsoon MCZ cannot survive for longer than a month without reestablishment by the secondary MCZ. Possible underlying mechanisms are also discussed.

'File' Attachments: internal-pdf://Sikka_Gadgil_1980-0144265731/Sikka_Gadgil_1980.pdf

Reference Type: Book

Record Number: 602

Author: I. Sindiga

Year: 1999

Title: Tourism and African development : change and challenge of tourism in Kenya

Series Title: Aldershot: Ashgate, Research series 14

Publisher: Ashgate Publishing Ltd.

Pages: XVI, 214 p

Short Title: Tourism and African development : change and challenge of tourism in Kenya

ISBN: 0-7546-1274-0

Abstract: The contribution of tourism to African development is discussed, using Kenya as a country case. Whether tourism is a viable development strategy for Africa is assessed, using the following criteria: the contribution of tourism in development; the development of tourism in Kenya; the outcomes of international tourism on the environment and society in Kenya; the response of Kenyan communities to international tourism; and to make recommendations for alternative tourism strategies with applicability to other African countries. The volume comprises 9 chapters: international tourism and Africa; tourism and development in Africa; Kenya's biophysical and social environment; tourism in Kenya; the structure of Kenya's tourism industry; change and challenge of unplanned tourism development; alternative tourism and sustainable development; regional cooperation in tourism and conclusions.

Author Address: Depart. Moi University Eldoret Kenya

Reference Type: Journal Article

Record Number: 553

Author: S. L. Smith and L. A. Codispoti

Year: 1980

Title: Southwest monsoon of 1979: chemical and biological response of Somali coastal waters

Journal: Science

Volume: 209

Pages: 597-600

Short Title: Southwest monsoon of 1979: chemical and biological response of Somali coastal waters

Abstract: In 1979 two areas of upwelling were observed off Somalia, one near 10°N and one near 5°N . The areas of upwelling were characterized by sea surface temperatures between 17°C and 22°C , high concentrations of surface nutrients (5 to 20 micromoles of nitrate per liter) and surface chlorophyll a (0.4 to 5.0 milligrams per cubic meter), primary productivity averaging 1.7 grams of carbon per square meter per day, and a phytoplankton assemblage dominated numerically by the diatom *Nitzschia delicatissima*.

Reference Type: Book

Record Number: 576

Author: M. D. Spalding and C. D. E. Field

Year: 1997

Title: World Mangrove Atlas. The International society for Mangrove Ecosystems

City: Okinawa, Japan

Pages: 178 pp.

Short Title: World Mangrove Atlas. The International society for Mangrove Ecosystems

Reference Type: Book

Record Number: 577

Author: M. D. Spalding, C. Ravilious and E. P. Green

Year: 2001

Title: World Atlas of Coral Reefs

City: Berkeley, C.A.

Publisher: University of California Press

Pages: 421pp

Short Title: World Atlas of Coral Reefs

Keywords: CORAL REEF; ATLAS; GLOBAL,Natural System

Reference Type: Thesis

Record Number: 603

Author: W. Stolte

Year: 1996

Title: Size-dependent restriction on competition for nutrients by marine phytoplankton

University: Rijksuniversiteit Groningen

Number of Pages: 122

Short Title: Size-dependent restriction on competition for nutrients by marine phytoplankton

Reference Type: Journal Article

Record Number: 518

Author: E. R. Thieler

Year: 2001

Title: Modern sedimentation on the shore face and inner continental shelf at Wrightsville Beach, North Carolina, U.S.A

Journal: Journal of Sedimentary Research

Volume: 71

Issue: 6

Pages: 958-970

Short Title: Modern sedimentation on the shore face and inner continental shelf at Wrightsville Beach, North Carolina, U.S.A

Abstract: The geologic framework and surficial morphology of the shoreface and inner continental shelf off the Wrightsville Beach, North Carolina, barrier island were mapped using high-resolution sidescan-sonar, bathymetric, and seismic-reflection surveying techniques, a suite of over 200 diver vibracores, and extensive seafloor observations by divers. The inner shelf is a sediment-starved, active surface of marine erosion; modern sediments, where present, form a patchy veneer over Tertiary and Quaternary units. The lithology of the underlying units exerts a primary control on the distribution, texture, and composition of surficial sediments, as

well as inner-shelf bathymetry. The shoreface is dominated by a linear, cross-shore morphology of rippled scour depressions (RSDs) extending from just seaward of the surf zone onto the inner shelf. On the upper shoreface, the RSDs are incised up to 1 m below surrounding areas of fine sand, and have an asymmetric cross section that is steeper-sided to the north. On the inner shelf, the RSDs have a similar but more subdued cross-sectional profile. The depressions are floored primarily by shell hash and quartz gravel. Vibracore data show a thick (up to 1.5 m) sequence of RSD sediments that unconformably overlies ancient coastal lithosomes. In this sediment-starved inner shelf setting, rippled scour depressions probably form initially on preexisting coarse-sediment substrates such as modern lag deposits of paleofluvial channel lithosomes or ancient tidal inlet thalwegs. Interannual observations of seafloor morphologic change and the longer-term record contained in vibracores suggest that the present seafloor morphology is either relatively stable or represents a recurring, preferential morphologic state to which the seafloor returns after storm-induced perturbations. The apparent stability is interpreted to be the result of interactions at several scales that contribute to a repeating, self-reinforcing pattern of forcing and sedimentary response which ultimately causes the RSDs to be maintained as sediment-starved bedforms responding to both along-shore and across-shore flows. Sediment accumulation from over 30 years of extensive beach nourishment at Wrightsville Beach appears to have exceeded the local shoreface accommodation space, resulting in the "leaking" of beach and shoreface sediment to the inner shelf. A macroscopically identifiable beach nourishment sediment on the shoreface and inner shelf was used to identify the decadal-scale pattern of sediment dispersal. The nourishment sediment is present in a seaward-thinning wedge that extends from the beach over a kilometer onto the inner shelf to waters depths of 14 m. This wedge is best developed offshore of the shoreline segment that has received the greatest volume of beach nourishment.

URL:

<http://payperview.datapages.com/data/open/offer.do?target=%2Fsepm%2Fjournals%2Fv72%2Fdata%2F071%2F071006%2Fpdfs%2F0958.pdf>

'File' Attachments:

internal-pdf://thieler_et_al_wrightsville_JSR_2001[1]-3234027264/thieler_et_al_wrightsville_JSR_2001[1].pdf

Author Address: U.S. Geological Survey, 384 Woods Hole Road, Quissett Campus, Woods Hole, Massachusetts, U.S.A. 02543-1598; rthieler@usgs.gov

Reference Type: Book Section

Record Number: 597

Author: UN

Year: 1982

Title: United Nations Convention on Law of the Sea (UNCLOS), 1982

Book Title: Topics Fact Sheets. The United Nations Convention on the Law of the Sea. William Edeson. In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated

Short Title: United Nations Convention on Law of the Sea (UNCLOS), 1982

Abstract: The United Nations Convention on the Law of the Sea (the Convention) was adopted on 10 December 1982 and came into force on 16 November 1996. The Convention establishes a

comprehensive legal regime covering all aspects of the seas and oceans. These include: universally agreed limits on the territorial sea, contiguous zone and the exclusive economic zone and the continental shelf; the regimes of innocent passage through the territorial sea, transit passage through straits used for international navigation and archipelagic sea lanes passage through archipelagic waters; a framework for conservation and utilization of the living marine resources; a new regime for the deep seabed beyond national jurisdiction; new rules for protection and preservation of the marine environment from pollution; new rules on marine and scientific research; and, the peaceful settlement of disputes concerning the interpretation and application of the provisions of the Convention

URL: <http://www.fao.org/fishery/topic/14839/en>

Reference Type: Report

Record Number: 596

Author: UN

Year: 1995

Title: United Nations Fish Stocks Agreement: United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks Sixth Session

Document Number: FAO Fisheries Topics: Governance. United Nations Fish Stocks Agreement. David Doulman. In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 27 May 2005.

Short Title: United Nations Fish Stocks Agreement: United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks Sixth Session

Abstract: The Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1995 UN Fish Stocks Agreement) was adopted on 4 August 1995. The Agreement entered into force on 11 December 2001, one month after the deposit of the thirtieth instrument of ratification or accession with the depository, the Secretary-General of the United Nations. The purpose of the 1995 UN Fish Stocks Agreement is to facilitate the implementation of certain provisions of the 1982 United Nations Convention on the Law of the Sea (1982 Convention) concerning the conservation and management of straddling fish stocks and highly migratory fish stocks. The Agreement complements the 1993 FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (1993 FAO Compliance Agreement) and the 1995 FAO Code of Conduct for Responsible Fisheries.

Reference Type: Report

Record Number: 578

Author: UNEP/NCS

Year: 2009

Title: Transboundary Diagnostic Analysis of Land-Based sources and activities in WIO Region,

City: UNEP, Nairobi, Kenya.

Pages: 291pp

Short Title: Transboundary Diagnostic Analysis of Land-Based sources and activities in WIO Region,

'File' Attachments: internal-pdf://WIOLAB_TDA-1-0942103040/WIOLAB_TDA-1.pdf

Reference Type: Journal Article

Record Number: 547

Author: M. M. van Katwijk, N. F. Meier, R. van Loon, E. M. van Hove, W. B. J. T. Giesen, G. van der Velde and C. den Hartog

Year: 1993

Title: Sabaki River sediment load and coral stress: correlation between sediments and condition of the Malindi-Watamu reefs in Kenya (Indian Ocean)

Journal: Marine Biology

Volume: 117

Issue: 4

Short Title: Sabaki River sediment load and coral stress: correlation between sediments and condition of the Malindi-Watamu reefs in Kenya (Indian Ocean)

ISSN: 0025-3162 (Print) 1432-1793 (Online)

Abstract: Sediment discharges from rivers have a negative impact on coral reef ecosystems. Indicators of coral decline measured in the present study were: (1) injury to living stony corals; (2) soft coral cover; and (3) bare rocky substrate suitable for colonization by corals. The relationship between these indicators and the distribution of terrigenous sediment was studied for the Malindi-Watamu fringing reef complex along the Kenyan coast off East Africa during 1982 and 1983. Decline of this reef had been repeatedly noted during the preceding decade. The influence of terrigenous sediment from the Sabaki River appears to be strongest in the Watamu area in the south and in the northern-most part of the Malindi reef area. Correlations, between each of the above three coral stress response indicators, on the one hand, and quantitative indicators of sediment loading, on the other hand, were not clear. However, a combined coral stress indicator involving all three factors was shown to have a clear relationship with terrigenous sediment loading and provided a rapid means of field evaluation of the effects of sediment stress on stony corals. Values for the combined coral stress indicator were found to increase in proportion to increasing values of terrigenous sediment loads in both study areas. A higher coral stress indicator value means a high proportion of injured or algae infested corals, and/or a high soft coral cover, and/or a high proportion of rocky substrate suitable for, but unoccupied by, living corals.

Author Address: Laboratory of Aquatic Ecology, Catholic University of Nijmegen, Toernooiveld, 6525 ED Nijmegen, The Netherlands

Reference Type: Conference Paper

Record Number: 528

Author: S. O. Wandiga

Year: 2005

Title: Distribution, Fate and Effects of Organochlorine Pesticides in the Kenyan Marine

Ecosystem.

Conference Name: In Regional Workshop on Ecotoxicology Monitoring and Control, February 2005. Unpublished.

Conference Location: Zanzibar

Reference Type: Journal Article

Record Number: 513

Author: S. O. Wandiga, P. O. Yugi, M. W. Barasa, I. O. Jumba and J. O. Lalah

Year: 2002

Title: The distribution of organochlorine pesticides in marine samples along the Indian Ocean coast of Kenya.

Journal: Environmental Technology

Volume: 23

Issue: 11

Pages: 1235-46

Short Title: Environ Technol.

Keywords: Coastal areas;

DDT

Data Collections; Dieldrin; Distribution; Fate of Pollutants; Fish; Fish (see also Individual groups); Marine Environment; Marine environment; Marine environment (see also Sea water); Marine fish; Marine pollution; Organic carbon; Organochlorine compounds; Pesticide residues; Pesticides; Pesticides (organochlorine); Pollution dispersion; Pollution effects; Rainy season; Sea water (see also Marine -----); Seawater; Seaweeds; Seaweeds (see also Marine algae, Marine plants); Sediment; Sediment Contamination; Sediment pollution; Sediments; Water Pollution Sources; Water pollution; Water sampling; Article Taxonomic Terms: *Siganus rivulatus*; ISW, Indian Ocean; ISW, Kenya, Coast; Indian Ocean; Kenya; Kenya, Coast, Malindi, Sabaki R.

Abstract: The concentrations of organochlorine residues of lindane, aldrin, proportional to -endosulfan, dieldrin, endrin, p,p'-DDE, p,p'-DDD and p,p'-DDT in samples of seawater, sediment, fish and seaweed from different locations along the coast of Kenya are discussed in relation to the geographical location of the sampling sites and potential sources of residue over a period of two years. All sediment samples were found to contain very low levels of organic carbon except those sampled from Sabaki River that had high (4.7%) organic carbon due to greater primary activity. Most of the pesticides residues (112 samples analysed in 1997 and 258 analysed in 1998/99) were detected in fish, water, sediments and seaweed. The concentration of some residues was higher during the wet season than the dry season in 1997, but no marked seasonal variation was observed in 1998/99. Lindane, aldrin, p,p'-DDT and p,p'-DDE were the most frequently observed residues in all samples while proportional to -endosulfan, dieldrin, p,p'-DDD and endrin were either present in low concentrations or absent in most samples. Water samples had the lowest concentrations of residues (range 0.503 - 9.025 ng g super(-1)). Sediments had the second highest levels of pesticides residues with a range of 0.584 - 59.00 ng g super(-1) while fish lipid content had the highest levels of residues in 1989/99 with p,p'-DDT concentration of 1011 ng g super(-1) and 418 ng g super(-1) p,p'-DDD in *Siganus rivulatus*.

Reference Type: Journal Article

Record Number: 570

Author: P. J. Webster, A. Moore, J. Loschnigg and R. Leben

Year: 1999

Title: Coupled ocean-atmosphere dynamics in the Indian Ocean during 1997-98

Journal: Nature

Volume: 401

Pages: 356-360

Short Title: Coupled ocean-atmosphere dynamics in the Indian Ocean during 1997-98

Abstract: Climate variability in the Indian Ocean region seems to be, in some aspects, independent of forcing by external phenomena such as the El Niño/Southern Oscillation. But the extent to which, and how, internal coupled ocean-atmosphere dynamics determine the state of the Indian Ocean system have not been resolved. Here we present a detailed analysis of the strong seasonal anomalies in sea surface temperatures, sea surface heights, precipitation and winds that occurred in the Indian Ocean region in 1997-98, and compare the results with the record of Indian Ocean climate variability over the past 40 years. We conclude that the 1997-98 anomalies-in spite of the coincidence with the strong El Niño/ Southern Oscillation event-may primarily be an expression of internal dynamics, rather than a direct response to external influences. We propose a mechanism of ocean-atmosphere interaction governing the 1997-98 event that may represent a characteristic internal mode of the Indian Ocean climate system. In the Pacific Ocean, the identification of such a mode has led to successful predictions of El Niño; if the proposed Indian Ocean internal mode proves to be robust, there may be a similar potential for predictability of climate in the Indian Ocean region.

Author Address: Program in Atmospheric and Oceanic Sciences, Campus Box 311, University of Colorado, Boulder, Colorado 80309-311, ETATS-UNIS

Reference Type: Journal Article

Record Number: 515

Author: T. M. Williams, J. G. Rees, A. Ferguson, R. A. Herd, K. K. Kairu and A. C. Yobe

Year: 1997

Title: Metals, petroleum hydrocarbons and organochlorines in inshore sediments and waters of Mombasa, Kenya

Journal: Marine Pollution Bulletin

Volume: 34

Issue: 7

Pages: 570-577

Short Title: MAR. POLLUT. BULL.].

Keywords: coastal waters; developing countries; hydrocarbons; marine pollution; metals; monitoring; pesticides; petroleum; petroleum hydrocarbons; pollution surveys; sediment contamination; sediment pollution; surveys; water pollution

Abstract: A coastal zone pollution monitoring programme for developing countries, the Land-Ocean Contamination Study (LOCS), was initiated by the British Geological Survey (BGS)

under funding from the United Kingdom Overseas Development Administration in 1995. The central objective of LOCS is the provision of contaminant monitoring, impact amelioration and integrated coastal zone management protocols to meet the specific social, technical and economic requirements of tropical developing regions. A geochemical and oceanographic survey of the inshore waters and sediments of Mombasa, Kenya was undertaken by BGS in liaison with the Kenya Marine and Fisheries Research Institute as a component of the LOCS programme during the period September 1995-January 1996 (Williams et al., 1996a). The vulnerability of both the inshore and nearshore environments to contamination arising from the urban and industrial expansion of Mombasa (compounded by recent tourist development) has been widely documented (e.g. UNEP, 1982). An inventory of industrial activities in Mombasa Municipality (Munga et al., 1994) indicates that suspended solid discharges may currently exceed 21 000 t yr⁻¹. The impact and fate of this contaminant flux within the coastal environment has not, however, previously been ascertained.

'File' Attachments: [internal-pdf://Rees97\[1\]-4065464576/Rees97\[1\].pdf](internal-pdf://Rees97[1]-4065464576/Rees97[1].pdf)

Reference Type: Report

Record Number: 514

Author: T. M. Williams, J. G. Rees, K. K. Kairu and A. C. Yobe

Year: 1996

Title: Assessment of contamination by metals and selected organic compounds in coastal sediments and waters of Mombasa, Kenya

Series Title: Overseas Geology Series Technical Report WC/97/37.

Pages: 85 pp..

Publisher: B. G. S. (UK).

Short Title: Assessment of contamination by metals and selected organic compounds in coastal sediments and waters of Mombasa, Kenya

Keywords: Coastal waters; Heavy metals; Marine pollution; Sedimentology; Suspended particulate matter; Trace elements; ISW, Kenya; ISW, Kenya, Mombasa, Tudor Creek

Abstract: Estuarine and coastal sites form important focal points for urban and industrial development world wide, offering favourable conditions for trade and transportation, marine fisheries exploitation and domestic industrial effluent disposal. Such diverse activities are, however, often poorly compatible and problems of coastal-zone pollution are becoming increasingly prevalent, with potentially severe environmental and socio-economic implications. Concentration of several potential toxic trace elements (e.g. Cr, As, Ni, Cu and V) are enriched in suspended particulate matter (SPM) in Tudor Creek, relative to SPM in other inshore and reef front waters. A spatial correlation between these metals and Mn is evident. Such trends are inconsistent with an anthropogenic control, and are almost certainly attributed to the dominance of mangrove-derived particulate matter in the overall SPM assemblage in Tudor Creek. Several heavy metals attain high concentrations in surface sediments around Mombasa. With the exception of Pb, Zn and Cu, the signatures are almost entirely related to lithology. Localised enrichment of Pb, Zn, and Cu is evident in close proximity to several known point-sources including sewage outfalls to the east of Mombasa Island, Likoni and Kilindini docks. Temporal flux variation, typically involving increased trace metal deposition towards the sediment-water

interface, are apparent from downcore concentration profiles through the sediments of Makupa creek, Port Kilindini and Tudor Creek. Following normalisation against Al sub(2)O sub(3) or TiO sub(2), however, no clear anthropogenic control can be identified. Sedimentary partitioning data for sediments from Makupa Creek indicate that labile geochemical fractions (e.g. reduced oxides) are significant as carriers of Mn, Pb, Cu, and Co. Detrital silicates and sulphides form the principal carriers of Fe, Al, V, Co, Cr and Ni. The available partitioning data and complementary data for interstitial pore-waters suggest that the post-depositional alteration of labile phases predominantly results in the immobilisation of metals as sulphides. Under such circumstances, the sediment reservoir can be considered to constitute a relatively long term contaminant sink.

'File' Attachments: [internal-pdf://Williams_et_al\[1\]-0857283840/Williams_et_al\[1\].pdf](internal-pdf://Williams_et_al[1]-0857283840/Williams_et_al[1].pdf)

Reference Type: Journal Article

Record Number: 525

Author: V. P. Wright and V. D. Vanstone

Year: 2001

Title: Onset of Late palaeozoic glacio-eustasy and the evolving climates of low latitudes areas; a synthesis of current understanding

Journal: Journal of the Geological Society

Volume: 158

Issue: 4

Pages: 579-582

Short Title: Onset of Late palaeozoic glacio-eustasy and the evolving climates of low latitudes areas; a synthesis of current understanding

Keywords: Carboniferous

glaciation

climate

eustasy

cyclicality

Abstract: Studies of depth sensitive carbonate successions in the UK indicate that regular, orbitally forced glacio-eustatic sea-level oscillations, which characterized the late Palaeozoic, started abruptly around 330 Ma (early Asbian). The Gondwanan ice sheet was highly sensitive to orbitally forced variations in solar insolation and the resultant sea-level oscillations had an approximate 100 ka periodicity. Studies of fossil soils and palaeokarst from low latitude settings suggest that pre-Asbian climates were relatively stable with infrequent changes. However, climatic changes became increasingly frequent in the Asbian and Brigantian, with regular fluctuations of a sub-100 ka periodicity occurring during glacial lowstand intervals.

Author Address: Department of Earth Sciences, Cardiff University, Cardiff CF10 3YE, UK

Reference Type: Journal Article

Record Number: 3

Author: A. Broderick, B. Godley and G. Hays

Year: 2001

Title: Trophic status drives inter-annual variability in nesting numbers of marine turtles.

Journal: Royal Society of London

Volume: Vol 268: 1481-1487

Type of Article: JOURNAL ARTICLE

Short Title: Trophic status drives inter-annual variability in nesting numbers of marine turtles.

Original Publication: Yes

Legal Note: Kenya

Keywords: Acanthaster planci outbreaks, crown-of-thorns, causes, nutrients, phytoplankton, Great Barrier Reef, larval development

Abstract: Large annual fluctuations are seen in breeding numbers in many populations of non-annual breeders. The interannual variation in nesting numbers of populations of green (Chelonia mydas) (n ^ 16 populations), loggerhead (Caretta caretta) (n ^ 10 populations), leatherback (Dermochelys coriacea) (n ^ 9 populations) and hawksbill turtles (Eretmochelys imbricata) (n ^ 10 populations) were examined. Interannual variation was greatest in the green turtle. When comparing green and loggerhead turtles nesting in Cyprus we found that green turtles were more likely to change the interval between laying seasons and showed greater variation in the number of clutches laid in a season. These differences are driven by the varying trophic status of the different species. Green turtles are herbivorous, feeding on sea grasses and macro-algae, and this primary production will be more tightly coupled with prevailing environmental conditions than the carnivorous diet of the loggerhead turtle.

Notes: 6001

'File' Attachments: internal-pdf://Broderick-2231826688/Broderick.pdf

Reference Type: Journal Article

Record Number: 2

Author: J. Brodie, K. Fabricius, G. De'ath and K. Okaji

Year: 2005

Title: Are increased nutrient inputs responsible for more outbreaks of crown-of-thorns starfish? An appraisal of the evidence

Journal: Marine Pollution Bulletin

Volume: Vol 51

Pages: 266-278

Type of Article: JOURNAL ARTICLE

Short Title: Are increased nutrient inputs responsible for more outbreaks of crown-of-thorns starfish? An appraisal of the evidence

Legal Note: Kenya

Keywords: Acanthaster planci outbreaks, crown-of-thorns, causes, nutrients, phytoplankton, Great Barrier Reef, larval development

Abstract: The cause(s) of primary outbreaks of the coral-eating crown-of-thorns starfish (Acanthaster planci) are still subject to scientific controversy. The possibility of primary outbreaks being linked to terrestrial runoff has been postulated a number of times, suggesting that enhanced nutrient supply is critical for enhanced A. planci larval development. This paper

examines the evidence for such a cause, focussing particularly on the Great Barrier Reef (GBR). Nutrient discharges from rivers have increased at least four-fold in the central GBR over the last century, and concentrations of large phyto-plankton (>2lm) of the inshore central GBR shelf in the wet season when *A. planici* larvae develop, is double that of other places and times. Larval development, growth and survival increase almost ten-fold with doubled concentrations of large phyto-plankton. This and other lines of evidence suggest that frequent *A. planici* outbreaks on the GBR may indeed be a result of increased nutrient delivery from the land.

Notes: 6003

'File' Attachments: <internal-pdf://Brodie-0889730816/Brodie.pdf>

Reference Type: Journal Article

Record Number: 4

Author: L. A. Drake, M. A. Doblin and F. C. Dobbs

Year: 2007

Title: Potential microbial bioinvasions via ships' ballast water, sediment, and biofilm.

Journal: Marine Pollution Bulletin

Volume: 55

Pages: 333-341

Date: 2007

Type of Article: Journal Article

Short Title: Potential microbial bioinvasions via ships' ballast water, sediment, and biofilm.

Reviewed item: POPs

Legal Note: Kenya

Keywords: invasive species, mechanisms, ballast water, biofilm, sediment

Abstract: A prominent vector of aquatic invasive species to coastal regions is the discharge of water, sediments, and biofilm from ships' ballastwater tanks. During eight years of studying ships arriving to the lower Chesapeake Bay, we developed an understanding of the mechanisms by which invasive microorganisms might arrive to the region via ships. Within a given ship, habitats included ballast water, unpumpable water and sediment (collectively known as residuals), and biofilms formed on internal surfaces of ballast-water tanks. The estimated concentration of microorganisms was greatest in ballast water _ sediment and water residuals biofilms. From the results, it is clear microorganisms may be transported within ships in a variety of ways.

Notes: 6004

'File' Attachments: <internal-pdf://Drake-3960801536/Drake.pdf>

Reference Type: Journal Article

Record Number: 5

Author: M. R. Fish, I. Cote, J. Gill, J. Andrew, S. Renshoff and R. Watkinson

Year: 2005

Title: Predicting the Impact of Sea Level Rise on Caribbean Sea Turtle Nesting habitats.

Journal: Conservation Biology

Volume: 19

Issue: 2

Pages: 482 - 491

Date: 2005

Type of Article: Journal Article

Short Title: Predicting the Impact of Sea Level Rise on Caribbean Sea Turtle Nesting habitats.

Legal Note: Kenya

Keywords: climate change, GIS, habitat loss, turtle nesting beaches

Abstract: The projected rise in sea level is likely to increase the vulnerability of coastal zone in the Caribbean which are already under pressure. One of the major effects will be loss of beach habitat, which provides nesting sites for endangered sea turtles. To assess the potential impacts of sea level rise, we used beach profile measurements in turtle nesting beaches in Bonaire, Netherlands Antilles to model predictions. Beaches varied in beach characteristics. Vulnerability varied with land use adjacent to the beach. The predictions about loss of beach habitat have important implications for turtle populations.

Notes: 6005

'File' Attachments: internal-pdf://Fish-0521722368/Fish.pdf

Reference Type: Journal Article

Record Number: 6

Author: J. Frazier

Year: 1975

Title: Exploitation of Marine Turtles

Journal: East African Wildlife Society

Type of Article: Report

Short Title: Exploitation of Marine Turtles

Legal Note: Kenya

Keywords: Fish and fish resources

Abstract: Government reports relevant to the green turtle fishery in eastern Africa were examined. The data reveals export of tortoise shell during the past century. The fishery is evidently of little importance in Kenya however in Zanzibar, the trade was once one of the largest in the world. The fishery has however dwindled primarily due to overexploitation in all the areas concerned.

Notes: 6006

Reference Type: Journal Article

Record Number: 7

Author: J. Frazier

Year: 1982

Title: Status of Sea Turtles in the Central Western Indian Ocean. In: K.A. Bjorndal (editor) Biology and Conservation of Sea Turtles.

Date: 1982

Short Title: Status of Sea Turtles in the Central Western Indian Ocean. In: K.A. Bjorndal (editor) Biology and Conservation of Sea Turtles.

Keywords: Reptiles

Abstract: An assessment of the status and distribution of sea turtle populations in 7 territories of the Central Western Indian Ocean (BIOT, Seychelles, Mayotte, Comores, Tanzania, Kenya and Somalia) was done. These areas have some of the best known turtle areas in the world. All 5 of the pantropical species were recorded, but only Chelonia and Eretmochelys are common. Numbers of both species seem below former levels, and it is likely that marine turtles remain the important resource they once were. Nesting reserves and protective legislation are needed in Moheli, Mayotte and Ras Biongwe, Kenya, and effective legislation is urgently required

Notes: 6007

Reference Type: Journal Article

Record Number: 8

Author: I. S. S. G. (ISSG)

Year: 2009

Title: Global Invasive Species Database (GISD)

Short Title: Global Invasive Species Database (GISD)

Keywords: Invasive Species, Database

Abstract: This interactive database provides an up to date synthesis of documented and potentially invasive species in all countries

Notes: 6008

URL: (<http://www.issg.org/database>)

Reference Type: Journal Article

Record Number: 9

Author: I.-T. W. C. Union

Year: 2000

Title: Guidelines for the Prevention of Biodiversity Loss caused by Alien Invasive Species. IUCN-the World Conservation Union species Survival Commission, Invasive Species Specialist Group.

Journal: IUCN

Type of Article: Report

Short Title: Guidelines for the Prevention of Biodiversity Loss caused by Alien Invasive Species. IUCN-the World Conservation Union species Survival Commission, Invasive Species Specialist Group.

Legal Note: Kenya

Keywords: biodiversity Loss, alien invasive species,

Abstract: A global overview of the causes, vectors, impacts of invasive species and guidelines for their prevention are presented

Notes: 6009

URL: http://www.issg.org/pdf/guidelines_iucn.pdf

'File' Attachments: internal-pdf://guidelines_iucn[1]-0525565696/guidelines_iucn[1].pdf
Language: English

Reference Type: Journal Article

Record Number: 10

Author: S. H. Ligon

Year: 1976

Title: Aerial survey of the dugong, *Dugong dugon*, in Kenya

Journal: FAO

Short Title: Aerial survey of the dugong, *Dugong dugon*, in Kenya

Legal Note: Kenya

Keywords: Aerial surveys; Stock assessment; *Dugong dugon*, Kenya

Abstract: An aerial survey, following a grid pattern along the 300 miles of the Kenya coast and out to the drop-off of the continental shelf, was conducted to assess the stocks of dugongs in this area. In a total of 12.17 h of survey, 8 dugongs, 21 whale sharks, 142 sea turtles and 447 dolphins were recorded, as well as millions of large jellyfish. 4 of the dugongs were alone, and 2 were cows with calves. It is suggested that the discrepancy between the fishermen's reports of 'herds' of dugongs and the survey results may be due to either a reduction in numbers in the area possibly owing to high human predation, or the Kenyan dugong population may be migratory, although there are no records of migratory behaviour in these animals.

Notes: 6010

Language: English

Reference Type: Journal Article

Record Number: 11

Author: J. Kiszka, C. Muir, C. Poonian, T. M. Cox, O. A. Amir, J. Bourjea, Y. Razafindrakoto, N. Wambiji and N. Bristol

Year: 2008

Title: Marine Mammal Bycatch in the Southwest Indian Ocean: Review and Need for a Comprehensive Status Assessment

Journal: Western Indian Ocean Journal of Marine Science

Volume: 7

Issue: 2

Pages: 119-136

Date: 2008

Short Title: Marine Mammal Bycatch in the Southwest Indian Ocean: Review and Need for a Comprehensive Status Assessment

Keywords: bycatch; marine mammals; southwest Indian Ocean; gillnets; longline; handline.

Abstract: Incidental catch in fishing gears is a serious threat to marine megafauna (sea turtles, sharks and marine mammals) at the global scale. In order to manage this threat, it is critical to assess its extent, both spatially and quantitatively. In the southwest Indian Ocean (from 0 to 25°S, from eastern Africa to 60°E), there is a paucity of information on marine mammal bycatch. This report reviews the marine mammal bycatch issue in this region in the following countries: Mozambique, Tanzania (including Zanzibar), Kenya, the Seychelles, the Comoros, Mayotte,

Madagascar, Reunion Island and Mauritius. For each country, status of marine mammals, fishing effort, bycatch information and mitigation measures are reviewed. It appears that quantitative information (number of bycaught animals per species, impact on local populations) is limited (except for Zanzibar). However, it is clear that several fisheries incidentally catch marine mammals in the region, most notably gillnets catching dugong (*Dugong dugon*) and coastal dolphins (*Tursiops aduncus* and *Sousa chinensis*), in Zanzibar, southwest Madagascar and probably Kenya. Mitigation measures are limited, particularly efforts to reduce the use of these gears. It is now critical to quantify the extent of bycatch in gillnets and its impact on local marine mammal populations and to implement relevant and effective mitigation measures as necessary.

Notes: 6011

'File' Attachments: internal-pdf://Kiszka2009-3803203840/Kiszka2009.pdf

Language: English

Reference Type: Journal Article

Record Number: 12

Author: M. Lutcavage, P. Plotkin, B. Witherington and P. L. Lutz

Year: 1997

Title: Human Impacts on Sea Turtle Survival. In: P.L. Lutz and J. Musick (eds) *The Biology of Sea Turtles*.

Journal: CRC Press

Type of Article: Book Chapter

Short Title: Human Impacts on Sea Turtle Survival. In: P.L. Lutz and J. Musick (eds) *The Biology of Sea Turtles*.

Legal Note: Kenya

Keywords: Human Impacts, Sea Turtles

Abstract: The challenges that sea turtles now face from human activities impact every stage of their life cycle, from loss of nesting beach and foraging habitats to mortalities on the high seas through intense pelagic fishing practices. They are also harmed by the increasing loads of non-biodegradable waste and pollutants that the oceans and coastal zones now receive. This review gives an overview of all human activities that adversely affect sea turtles including beach armoring, beach nourishment and sand mining, beach cleaning and driving, artificial lighting, human presence, boat strikes, dredging, oil pollution, plastics and non-biodegradable debris, entanglement in fishing gears, and direct artisanal fishing.

Notes: 6012

Language: English

Reference Type: Journal Article

Record Number: 13

Author: H. Marsh, H. Penrose, C. Eros and J. Hughes

Year: 2002

Title: Dugong Status Report and Action Plans for Countries and Territories.

Journal: UNEP

Issue: UNEP/DEWA/RS 02-1; 172 PP

Type of Article: TECHNICAL REPORT

Short Title: Dugong Status Report and Action Plans for Countries and Territories.

Legal Note: Kenya

Keywords: dugong status and management, global overview

Abstract: This document presents a global overview of the status of the dugong and its management in the various countries in its range. The document contains information from surveys conducted on dugong distribution and abundance, threatening processes, legislation, and existing and suggested research and management initiatives for 37 countries and territories in the dugong's known range. The report is organised in a geographical sequence from the Western Indian Ocean region, through to the South West Pacific. Candidate areas for dugong conservation have been identified in much of the dugong's range and in this document emphasises strategies for identifying additional areas.

Notes: 6013

'File' Attachments: internal-pdf://DUGONG-2535786496/DUGONG.pdf

Language: English

Reference Type: Journal Article

Record Number: 14

Author: N. Mrosovsky, and C.L. Yntema

Year: 1980

Title: Temperature Dependence of Sexual Differentiation in Sea Turtles: Implications for Conservation Practices.

Journal: Biological Conservation

Volume: Vol 18:271-280.

Type of Article: JOURNAL ARTICLE

Short Title: Temperature Dependence of Sexual Differentiation in Sea Turtles: Implications for Conservation Practices.

Legal Note: Kenya

Keywords: Reptiles

Abstract: Data on the effect of incubation temperature of the eggs on sexual differentiation in turtles are briefly reviewed. A change of 1–2°C can make a considerable difference to the sex ratio of the hatchlings. Current conservation methods include incubation of eggs in styrofoam boxes above ground, establishment of central hatcheries, incubation in reduced clutch sizes and egg harvesting only during certain seasons. The thermal aspects of these practices are analysed. It is concluded that incubation of eggs in styrofoam boxes runs the risk of masculinising turtle populations, and that other practices may effect sex ratio in ways that cannot yet be specified. More work on this problem is urgently needed before unevaluated methods become accepted procedures

Notes: 6014

Reference Type: Journal Article

Record Number: 15

Author: N. Mrosovsky

Year: 1994

Title: Sex Ratios of Sea Turtles

Journal: Journal of Experimental Zoology

Volume: 270

Pages: 16-27

Type of Article: JOURNAL ARTICLE

Short Title: Sex Ratios of Sea Turtles

Legal Note: Kenya

Keywords: sea turtles, TSD, sex ratios

Abstract: This paper focuses on possible explanations for data on sex ratios of sea turtle hatchlings rather than on explanations for the existence of Temperature Sex Determination, (TSD) although the two are interrelated. Different species within a family can exhibit either TSD on the other hand, the sex ratios resulting from TSD do appear to be subject to constraints. In sea turtles, the combination of relatively similar pivots, nest site, and nest season fixity seem to dictate overall sex ratios in a given year and the way the overall values are achieved, the SSPPs. Doubtless imaginative scenarios could be devised for why in midseason loggerheads should produce females, and greens males, but these should be viewed as consequences rather than reasons for TSD.

Notes: 6015

'File' Attachments: [internal-pdf://sexratio\[1\]\[1\]-0974703360/sexratio\[1\]\[1\].pdf](internal-pdf://sexratio[1][1]-0974703360/sexratio[1][1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 16

Author: E. a. J. M. Mueni

Year: 2001

Title: A survey on the use of Turtle Excluder Devices (TEDs) in trawlers along the Kenyan coast.

Journal: KESCOM

Type of Article: TECHNICAL REPORT

Short Title: A survey on the use of Turtle Excluder Devices (TEDs) in trawlers along the Kenyan coast.

Legal Note: Kenya

Keywords: TRAWLERS, SEA TURTLES , IMPACTS, TURTLE EXCLUDER DEVICES

Abstract: A survey was conducted to assess bycatch on trawlers and impacts of turtle excluder devices. The survey estimated that at least 3 turtles are caught in trawl nets per fishing day although this varied greatly with season. Compliance for TED usage was also found to be very low, due to complaints by the trawler operators of a reduction in catch due to clogging of nets by debris. Use of TEDs should be encouraged and be made mandatory.

Notes: 6016

Language: English

Reference Type: Conference Paper

Record Number: 17

Author: G. M. Okemwa, N. A. Muthiga and E. M. e. Mueni

Year: 2005

Title: Proceedings of the Western Indian Ocean Region Marine Turtle Conservation Workshop.

Conference Name: Proceedings of the Western Indian Ocean Region Marine Turtle Conservation Workshop.

Conference Location: Mombasa, Kenya

Type: TECHNICAL REPORT

Pub Place: Kenya

Keywords: Status, WIO region, Sea Turtles, WIOMSA

Abstract: The states of the WIO region share one or more populations of five sea turtle species (green, hawksbill, loggerhead, leatherback, and olive ridley). However, although our governments recognize the transboundary nature of marine turtles, there has been limited appreciation of the value of using collective and synergistic responsibility to address threats to marine turtles. Recognizing other past and current initiatives to address sea turtle conservation and management on a regional scale; a Western Indian Ocean marine turtle workshop, jointly supported by WIOMSA, IUCN, WWF, CMS, and WCS and jointly hosted and organized by KWS and KESCOM was held from 16th to 17th September 2004. The theme of the workshop was to strengthen regional collaboration in research, conservation and management of sea turtles in the Western Indian Ocean (WIO) Region. Participants from 7 countries (Kenya, Seychelles, Tanzania, Madagascar, Mauritius, South Africa, Reunion and U.S.A attended the workshop. A coordination/networking strategy for marine turtle conservation and management in the WIO region was discussed and adopted; Reviews of national status were presented and adopted modalities adopted for the production of a Regional Marine Turtle Status report. Detailed summaries of national presentations on status and recommendations from discussions are presented.

Notes: 6017

'File' Attachments:

internal-pdf://WIO_MTWorkshop_proceedings[1]-0738582272/WIO_MTWorkshop_proceedings[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 18

Author: G. M. Okemwa, S. Nzuki and E. M. Mueni

Year: 2004

Title: The status and conservation of sea turtles in Kenya.

Short Title: The status and conservation of sea turtles in Kenya.

Legal Note: Kenya

Abstract: Five species of sea turtles have been documented as occurring within Kenyan waters: the green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), loggerhead turtle (*Caretta caretta*), olive ridley turtle (*Lepidochelys olivacea*) and the leatherback turtle (*Dermochelys coriacea*). Of these, green, hawksbill and olive ridley turtles are known to nest in Kenya. Green turtle nests represented 91% of the national sightings reported to KESCOM. The necropsy data suggests that gill net fishing activities may be

responsible for over 80% of all turtle mortality in Kenya. Approximately 58% of the sea turtles were thought to have been killed as a result of entrapment in fishing nets.

Notes: 6018

URL: Seaturtle.org

Language: English

Reference Type: Journal Article

Record Number: 19

Author: G. M. Ruiz, J. T. Carlton, E. D. Grosholz and A. H. Hines

Year: 1997

Title: Global Invasions of Marine and Estuarine Habitat by Non-Indigenous Species: Mechanisms, Extent and Consequences.

Journal: American Zoologist

Volume: Vol. 37:621-632.

Type of Article: JOURNAL ARTICLE

Short Title: Global Invasions of Marine and Estuarine Habitat by Non-Indigenous Species: Mechanisms, Extent and Consequences.

Legal Note: Kenya

Keywords: Non-indigenous species, dispersal mechanisms, ballast water, invasions, consequences, marine habitats

Abstract: Non-indigenous species (NIS) are increasingly conspicuous in marine and estuarine habitats throughout the world, as the number, variety, and effects of these species continue to accrue. Most of these NIS invasions result from anthropogenic dispersal. Although the relative importance of different dispersal mechanisms varies both spatially and temporally, the global movement of ballast water by ships appears to be the largest single vector for NIS transfer today, and many recent invasions have resulted from this transfer. The rate of new invasions may have increased in recent decades, perhaps due to changes in ballast water transport. Estuaries have been especially common sites of invasions, accumulating from tens to hundreds of NIS per estuary that include most major taxonomic and trophic groups. Although our present knowledge about the extent, patterns and mechanisms of marine invasions is still in its infancy, it is clear that NIS are a significant force of change in marine and especially estuarine communities globally. Based upon the documented extent of NIS invasions and scope of their effects, studies of marine communities that do not include NIS are increasingly incomplete.

Notes: 6019

'File' Attachments: internal-pdf://Ruiz-1045157376/Ruiz.pdf

Language: English

Reference Type: Journal Article

Record Number: 20

Author: A. Solow, K. Bjorndal and A. Bolten

Year: 2002

Title: Annual Variation in Nesting Numbers of Marine Turtles: The Effect of Sea Surface Temperature on Remigration Intervals.

Journal: Ecological Letters

Volume: 5

Issue: 6

Pages: 742-746

Type of Article: Journal Article

Short Title: Annual Variation in Nesting Numbers of Marine Turtles: The Effect of Sea Surface Temperature on Remigration Intervals.

Legal Note: Kenya

Keywords: Climate change; Loggerhead sea turtle; Nesting trends; Pacific; SST; ecological modelling

Abstract: It is widely held that pelagic longline fisheries pose the major risk for Pacific loggerheads but the effects of other risk factors such as human-induced global climate change have rarely been considered. So we explored whether regional ocean temperatures affect the long-term nesting population dynamics for the 2 Pacific loggerhead genetic stocks (Japan, Australia) through regression modelling. We found that both Pacific stocks have been exposed to slowly increasing trends in mean annual sea surface temperature in their respective core regional foraging habitats over the past 50 years. We show that irrespective of whether a population was decreasing or increasing that there was an inverse correlation between nesting abundance and mean annual sea surface temperature in the core foraging region during the year prior to the summer nesting season. Cooler foraging habitat ocean temperatures are presumably associated with increased ocean productivity and prey abundance and consequently increased loggerhead breeding capacity. So warming regional ocean temperatures could lead to long-term decreased food supply and reduced nesting and recruitment unless Pacific loggerheads adapt by shifting their foraging habitat to cooler regions.

Notes: 6020

'File' Attachments: internal-pdf://Solow02-2119988480/Solow02.pdf

Language: English

Reference Type: Journal Article

Record Number: 21

Author: G. M. Wamukoya

Year: 1997

Title: Sea Turtle Recovery Action Plan for Kenya (STRAP)

Journal: KESCOM/KWS

Type of Article: Technical Report

Short Title: Sea Turtle Recovery Action Plan for Kenya (STRAP)

Legal Note: Kenya

Keywords: sea turtles, recovery plan, Kenya

Abstract: A sea turtle recovery action plan was developed by The Kenya Sea Turtle Conservation Committee (KESCOM) as part of the sea turtle conservation agenda. The document provides detailed information on the most current and comprehensive information on the distribution and status of sea turtles in Kenya, indicate gaps in present knowledge, reviews national legislation and international legal instruments, contemporary threats to sea turtles and recommendations for sustainable conservation management.

Notes: 6021

Language: English

Reference Type: Journal Article

Record Number: 22

Author: G. M. Wamukoya, J. M. Mirangi and W. K. Ottichillo

Year: 1995

Title: Marine aerial survey of the marine mammals, turtles, sharks and rays.

Pages: N°1: 48pp

Short Title: Marine aerial survey of the marine mammals, turtles, sharks and rays.

Legal Note: Kenya

Keywords: erial survey, Kenya, marine mammals, turtles, sharks and rays

Abstract: The aims of the aerial survey was to determine the occurrence, distribution and relative abundance of sea turtles, dugongs and whales and dolphins and to produce distribution maps. To provide recommendation for the regulation use of keys areas for sea turtles and marine mammals. To assess the possible interaction between marine mammals and sea turtles and fisheries by relating observed areas of occurrence of these animals to known fisheries operations. To train KWS personnel in the design, execution and identification of marine mammals, whale sharks and sea turtles from the air as many of them are accustomed to terrestrial air surveys. To use the data and information collected to formulate conservation and management and awareness programmes for the species concerned

Notes: 6022

Language: English

Reference Type: Journal Article

Record Number: 23

Author: G. M. Wamukoya, W. K. Otichillo and R. V. Salm

Year: 1996

Title: Aerial survey of dugong (Dugon dugon) in Ungwana Bay and the Lamu archipelago, Kenya.

Journal: Kenya Wildlife Service

Pages: N°2: 13pp

Short Title: Aerial survey of dugong (Dugon dugon) in Ungwana Bay and the Lamu archipelago, Kenya.

Legal Note: Kenya

Keywords: aerial survey, Kenya, dugongs

Abstract: From 29 October to 1 November 1975, an aerial survey of dugongs (D. dugon) was made along the entire coast of Kenya, following a grid pattern covering 25% of the area between the shore and the end of the continental shelf and totalling 12.17 hours of observation. Even with favourable conditions, only 8 animals were seen, 4 of them alone and 2 cows with calves; the smaller calf was seen riding on its mother's back. The discrepancy between these results and earlier reports of large numbers of dugongs off Kenya, may be due to their absence because of migration or to the deliberate or incidental capture of dugongs by native fishermen, which has probably greatly reduced the population in the region.

Notes: 6023

Language: English

Reference Type: Journal Article

Record Number: 24

Author: W. E. A. M. Ecoregion.

Year: 2004

Title: Towards a Western Indian Ocean Dugong Conservation Strategy: The status of Dugongs in the Western Indian Ocean Region and Priority Conservation Actions.

Journal: WWF

Type of Article: Technical Report

Short Title: Towards a Western Indian Ocean Dugong Conservation Strategy: The status of Dugongs in the Western Indian Ocean Region and Priority Conservation Actions.

Legal Note: Kenya

Keywords: Western Indian Ocean region, dugongs, Status, Strategy

Abstract: In 2001, in recognition of the need for effective management of dugongs in the WIO region, Decision CP.3/4 of the 3rd Conference of the Parties of the Nairobi Convention, requested regional and international organisations to facilitate the development of a regional initiative to protect the dugong. In response to this decision, UNEP through the Nairobi Convention, with assistance from WWF and IUCN, provided financial support for countries in the region - Kenya, Tanzania, Mozambique, Seychelles, Comoros, Mayotte, Madagascar and la Réunion - to carry out a rapid national assessment of the status, distribution and threats to dugongs and identify key actions necessary for their recovery and long-term survival. A summary of the findings from the assessments are presented.

Notes: 6024

URL: (http://www.bornfree.org.uk/fileadmin/user_upload/files/reports/wwfdugongreport.pdf)

'File' Attachments:

[internal-pdf://EAME-Dugong-Strategy\[1\]-1754745344/EAME-Dugong-Strategy\[1\].pdf](internal-pdf://EAME-Dugong-Strategy[1]-1754745344/EAME-Dugong-Strategy[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 25

Author: R. Zanre

Year: 2005

Title: Report on Watamu Turtle Watch's sea turtle bycatch release programme, Watamu, Kenya.

Journal: Watamu Turtle Watch

Type of Article: Technical Report

Short Title: Report on Watamu Turtle Watch's sea turtle bycatch release programme, Watamu, Kenya.

Legal Note: Kenya

Keywords: sea turtles, bycatch, Kenya, Watamu, green turtles, Hawkbill, fishing, artisanal

Abstract: Anecdotal evidence has long suggested that the incidental capture of sea turtles by artisanal fishermen occurs regularly in the inshore waters of Kenya and surrounding region. It is

also widely known that turtles incidentally caught are inevitably slaughtered by local fishermen for their products, whether retrieved alive or dead from fishing gears. In 1998 Watamu Turtle Watch collected information related to artisanal capture, turtle biometrics and undertook tagging. Selected research findings are presented on 1,422 turtle release events (including 368 recaptures) over a six year period. 82% of turtles released were green turtles (*Chelonia mydas*), the remainder hawksbill (*Eretmochelys imbricata*) except for three Loggerheads (*Caretta caretta*). 96% of green and 79% of hawksbill captures were juvenile turtles. Based on bycatch data, recorded mortalities and fishermen interviews WTW estimates the total annual catch of turtles within the Watamu National Reserve area to be between 690 and 1160. This study illustrates the seriousness of the artisanal bycatch threat to regional turtle populations and the urgent need for conservation resources to be directed to further research and the initiation of conservation activities to address the artisanal bycatch problem.

Notes: 6025

Language: English

Reference Type: Report

Record Number: 26

Author: A. S. Norconsult

Year: 1975

Title: Mombasa water pollution and waste disposal study: Report to the Ministry of Local government

Volume: Vol. VI. 104 pp.

Type: Report

Short Title: Mombasa water pollution and waste disposal study: Report to the Ministry of Local government

Keywords: Mombasa, Kenya. pollution, waste disposal, Kilindini, Tudor, Near shore, Currents, Salinity and temperature

Abstract: Report is given on pollution and waste disposal from Kilindini Port. Physical and chemical data is given for a set of longitudinal stations in Kilindini and Tudor, as well as data for the near shore stations between Shelly beach to Mtwapa. The data includes tidal current magnitudes and speed at different depths in the harbor inlets. Physical and chemical characteristics of the harbors are wave pattern at the entrance are discussed. Currents are investigated using drifter deployed and traced both from inside and outside the entrance. Tidal currents are observed to turn southward at the entrance before turning northward to join the major East African Coastal Current beyond the reef.

Notes: 6026

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 27

Author: W. Düing and F. Schott

Year: 1978

Title: Measurements in the Source Region of the Somali Current during the monsoon Reversal

Journal: Journal of Physical Oceanography

Pages: 278-289

Start Page: J. Phys. Oceanogr.

Type of Article: Scientific Paper

Short Title: Measurements in the Source Region of the Somali Current during the monsoon Reversal

Legal Note: Kenya

Keywords: East African coast, source region of the Somali Current, temperature and current records, subsurface mooring, convergence zone, East Africa Coastal Current(EACC), thermocline, switching mechanism, monsoon onset

Abstract: Four subsurface mooring deployed off Kenya-the source region of the Somali Current (SC)- in mid-Jan to mid-Jul are used to obtain temperature and current records. Record for Jan-April showed that the array straddled the convergence zone of the SC and EACC during which time the flow was weak and variable, at all locations, except for southernmost location off Mombasa. The predominant variability had a time scale of 4-5 days. Around 20 April the wind shifted to the southeast and three days later the flow in the upper 80m turned northward and intensified. Development of strong flow below the thermocline took several more weeks. The observations implied that a switching mechanism took place at that time. The initially eastward flowing Equatorial Counter Current is shifted rapidly 45o to the left to run northward along the coast. This mechanism may, in part, be responsible for the impulsive beginning of the SC during the early stages of the monsoon onset south of the equator.

Notes: 6027

URL:

[http://journals.ametsoc.org/doi/pdf/10.1175/1520-0485\(1978\)008%3C0278:MITSR0%3E2.0.CO%3B2](http://journals.ametsoc.org/doi/pdf/10.1175/1520-0485(1978)008%3C0278:MITSR0%3E2.0.CO%3B2)

'File' Attachments: internal-pdf://Duing-0378295808/Duing.pdf

Language: English

Reference Type: Journal Article

Record Number: 28

Author: J. F. Henderson, J. Kagasi, M. Gikuhi and S. Njuguna

Year: 2008

Title: Seamounts Identified By High-Resolution Imagery Offshore Kenya

Journal: American Geophysical Union

Short Title: Seamounts Identified By High-Resolution Imagery Offshore Kenya

Legal Note: Kenya

Keywords: Continental shelf and slope processes (4219), 3025 Marine seismics (0935, 7294), 3039 Oceanic transform and fracture zone processes, 3045 Seafloor morphology, geology, and geophysics

Abstract: 10 km in diameter and 570 to 1740 m in height. The Davie Fracture Zone, a north-south trending transform fault was also identified in the seismic reflection profiles. The ridge, possibly extending from 26°S off south Madagascar to as far north as 2°S, is thought to have been created by the separation and direction of motion of Madagascar from Africa that began in the middle Jurassic. The discovery of these features and the integration of both

multibeam bathymetry and seismic reflection profiles provides new information in the study of seamount distribution and their relationship to nearby transform faults. Multibeam bathymetry and 2-D seismic reflection surveys were carried out between 2007 and 2008 by the Government of Kenya for the purpose of delineating Kenya's extended continental shelf beyond the 200 nautical mile boundary, as allowed under Article 76 of the United Nations Convention on the Law of the Sea (UNCLOS). The unique dataset acquired includes areas surveyed for the first time and provides new information on the geological processes of the continental shelf, slope and abyssal plain along the Kenyan passive margin. High-resolution multibeam bathymetry of almost the entire Kenyan continental slope was acquired using two multibeam systems (Kongsberg Simrad EM120 and EM710) aboard the M/V L'Espoir in November/December 2007. A multi-channel seismic survey followed in April/May 2008 (R/V Akademik Alexander Karpinsky) and provided high-resolution seismic reflection profiles. During these surveys, three features interpreted to be seamounts were discovered along Kenya's continental slope at water depths between 2750 and 3500 m. The size of the features varies from 2.5 to 10 km in diameter and 570 to 1740 m in height. The Davie Fracture Zone, a north-south trending transform fault was also identified in the seismic reflection profiles. The ridge, possibly extending from 26°S off south Madagascar to as far north as 2°S, is thought to have been created by the separation and direction of motion of Madagascar from Africa that began in the middle Jurassic. The discovery of these features and the integration of both multibeam bathymetry and seismic reflection profiles provides new information in the study of seamount distribution and their relationship to nearby transform faults.

Notes: 6028

URL: <http://adsabs.harvard.edu/abs/2008AGUFMNS13A1082H>

Language: English

Reference Type: Journal Article

Record Number: 29

Author: D. R. Johnson, M. M. Nguli and E. J. Kimani

Year: 1982

Title: Response to annually reversing monsoon winds at the Southern boundary of the Somali Current

Journal: Deep Sea Res. .

Volume: 29

Issue: 10A

Pages: 1217-1227

Type of Article: Journal Article

Short Title: Response to annually reversing monsoon winds at the Southern boundary of the Somali Current

Legal Note: Kenya

Keywords: Western boundary current, Monsoon current system, topographic forcing, vorticity model, Somali current,

Abstract: The transient monsoon current system of the northwestern Indian Ocean provides a unique opportunity to investigate the dynamics of rapid western boundary currents. In 1979,

part of the Indian Ocean Experiment (INDEX) focuses on the southern boundary of the annually reversing Somali Current where interaction with the East Africa Coastal Current is an important feature. This study presents current measurements in the southern boundary area and investigates a simple vorticity model that suggests that the location of the southern boundary and the rapid switching action of the currents may, in part, be topographically controlled. It seems reasonable that the convergence-deflection area may be limited in range by larger scale forcing, but within this range topographic forcing along the coast of Kenya places a local constraint on the occurrence of the deflection in location as well as in time. This has significant implications on understanding the transient processes associated with rapid boundary currents where redirection may play a major role.

Notes: 6029

'File' Attachments: internal-pdf://Johnson et al-1846131712/Johnson et al.pdf

Language: English

Reference Type: Journal Article

Record Number: 30

Author: D. Kirugara, U. Cederlöf and L. Rydberg

Year: 1998

Title: Wave-Induced Net Circulation in a Reef Fringed Lagoon: Bamburi, Kenya

Journal: Ambio

Volume: 27

Issue: 8

Pages: 752-757

Type of Article: Scientific Paper

Short Title: Wave-Induced Net Circulation in a Reef Fringed Lagoon: Bamburi, Kenya

Legal Note: Kenya

Abstract: Sea level and current measurements were carried out in Bamburi coral reef lagoon on the Kenyan coast. The lagoon is of a type that is common along the East Africa coastline as well as other parts of the tropical region. It consists of a semi continuous barrier reef, a few hundred meters wide and extending more or less parallel to the beach at a distance of a few kilometers. The tides are of fairly strong semidiurnal type, characterized by marked asymmetries in sea level and current cycles. At irregularly spaced points, the reef is broken with gaps large enough to permit a limited exchange with the ocean through tidal channels. The circulation in the lagoon is highly modified by the fringing reef, acting as a barrier when exposed during low water spring. Incoming swell continuously breaks on the reef-top, causing significant wave set-up and wave-induced volume flux, resulting in a net cross-reef flow of ocean water into the lagoon, being returned to the ocean through the tidal channels. Our data show a clear difference in the flow pattern between neap and spring tides. During the neap periods, the reef is more or less permanently submerged and ocean water flows into the lagoon for the complete tidal cycle with corresponding outward volume flux through the channel. At spring tide, the lagoon is cut off from the ocean at low tide, and there is a short period of intense inflow through the channel until the oceanic sea level reaches the reef top and flow direction is reversed. The lagoon water exchange is controlled by a number of factors such as reef submergence, characteristics of the incoming swell, pressure head and reef-bottom friction. A

simple analytical model, using parameterizations of wave set-up and flux has been applied to the lagoon, yielding reasonable results with volume inflow across the reef of similar order of magnitude as the observed net channel outflows. It is found that the important flushing mechanism for the lagoon is the continuous pumping of water over the reef and its exit through the channels. This process assures efficient flushing of the lagoon, securing good water quality inside the reef.

Notes: 6030

'File' Attachments: internal-pdf://Kirugara-1415212544/Kirugara.pdf

Language: English

Reference Type: Journal Article

Record Number: 31

Author: J. U. Kitheka

Year: 1997

Title: Coastal Tidally-driven circulation and role of water exchange in the linkage between tropical coastal ecosystems.

Journal: Estuarine, Coastal and Shelf Science

Volume: Volume 45, Number 2,

Pages: pp.177-187(11)

Type of Article: Scientific Paper

Short Title: Coastal Tidally-driven circulation and role of water exchange in the linkage between tropical coastal ecosystems.

Legal Note: Kenya

Keywords: Water circulation, Gazi Bay, ebb and flood flow, mangrove creek, tidal asymmetry, salinity maximum, brackish water

Abstract: Water circulation and exchange processes in a shallow, semi-enclosed tropical bay were studied in southern Kenya (Gazi Bay) through measurements of tidal elevations, salinity, temperature, dissolved oxygen and current velocities at stations established in mangrove creeks, sea grass beds and coral reef zones. Occurrence of wide shallow entrance, lack of topographic controls (sills) and the orientation of the Bay entrance with respect to dominant tidal water circulation patterns, accounts for the high rates of exchange (60-90% of the volume per tidal cycle) between the inshore and offshore waters. High flushing rates are coupled with short residence times in the order of 3-4 h. The dominant water circulation driving force is the semi-diurnal tide, causing a strong reversing current in the mangrove creeks (0.6 ms^{-1}) and low magnitude current in the sea grass and coral reef zones ($<0.30 \text{ ms}^{-1}$). Tidal asymmetry, characterized by stronger ebb flows than flood flows in the mangrove creeks, partly promotes the net export of organic matter to the seagrass beds. The brackish and turbid water plume in the mangrove creeks and south-western region of the Bay is trapped along the coast and in the mangrove swamp, and does not reach the coral reef. The freshwater influx via rivers and direct rainfall in the Bay accounts for a volume of $305\,000 \text{ m}^3$, of which 20% is lost as a result of enhanced evapotranspiration, which is also responsible for a salinity maximum zone (38) in the upper region of the Bay covered by mangroves.

Notes: 6031

'File' Attachments: internal-pdf://Kitheka-1997-4047956736/Kitheka-1997.pdf

Language: English

Reference Type: Journal Article

Record Number: 32

Author: R. A. Knox and D. L. T. Anderson

Year: 1985

Title: Recent advances in the study of the low-latitude ocean circulation

Journal: Progress in Oceanography

Volume: 14

Pages: 259-317

Type of Article: Scientific paper

Short Title: Recent advances in the study of the low-latitude ocean circulation

Legal Note: Kenya

Keywords: Ocean circulation, tropical ocean, low-frequency, large scale response, Indian monsoon, Pacific El-Nino, Atlantic seasonal cycle, upwelling, model

Abstract: We describe progress of the last decade or so, observational and theoretical, in the study of the time-dependent circulation of the tropical ocean, especially as forced by fluctuating winds. First we review basic theoretical concepts. We then take up the principal scientific problems of low-frequency, large-scale response, grouped by ocean: Indian monsoon-driven variability in the equatorial zone and Somali Current region. Pacific fluctuations during El Niño events. Atlantic the seasonal cycle and seasonal upwelling in the east. In each case we try to identify areas where models and observations agree, disagree, or simply do not reach.

Notes: 6032

Author Address: Department of Atmospheric Physics, University of Oxford, Clarendon Laboratory, Parks Road, Oxford OX1 3PU, U.K.

Language: English

Reference Type: Journal Article

Record Number: 33

Author: A. Leetmaa and H. Stommel

Year: 1980

Title: Equatorial current observation in the Western Indian Ocean in 1975 and 1976

Journal: Journal Physical Oceanography

Volume: 10

Pages: 258-269

Date: 1980

Type of Article: Journal Article

Short Title: J. Phys.Oceanogr

Legal Note: Kenya

Keywords: Equatorial current
western Indian Ocean
vertical profiles of current
temperature and salinity

thermocline

transient events

Abstract: Observations was made at the equator 3⁰S to 2⁰N along 55⁰30'E in the Western Indian Ocean in Feb-Jun of 1975-1976. A strong (0.8ms⁻¹) undercurrent was observed at the equator and at 3⁰S in May and June it moved southward and merged with southern region eastward flow. Strong anti-symmetrical transient flow affected the zonal flow.

Notes: 6032

Language: English

Reference Type: Journal Article

Record Number: 34

Author: M. E. Luther and J. J. O'Brien

Year: 1985

Title: A model on the seasonal circulation in the Arabian Seas forced by Observed winds

Journal: Progress In Oceanography

Volume: 14

Pages: 353-385

Type of Article: Scientific Paper

Short Title: A model on the seasonal circulation in the Arabian Seas forced by Observed winds

Legal Note: Kenya

Keywords: Numerical model, wind driven circulation, Arabian sea, Somali current system

Abstract: The ocean response to the monsoon winds is presented by a numerical model using climatology mean winds. Many of the observed features of the seasonal variation in the Somali Current system (east Africa coastal current, Somali current, Equatorial counter current, the Scotra and Great Whirl are reproduced, during the southeast and northeast monsoon seasons.

Notes: 6033

Language: English

Reference Type: Thesis

Record Number: 35

Author: C. Magori

Year: 1998

Title: Tidal propagation and water exchange in Mtwapa creek, Kenya

Short Title: Tidal propagation and water exchange in Mtwapa creek, Kenya

Keywords: Mtwapa Creek, Kenya coast, tides, tidal constituents, Semi-diurnal tides

Abstract: Tidal constituents form tidal, temperature and current data are calculated for Mtwapa Creek, Kenya. Form ratio is also calculated. Circulation is found to be dominated by tidal currents. The dominant tides are semi-diurnal M2 type.

Notes: 6034

'File' Attachments: internal-pdf://Magori thesis-3710413318/Magori thesis.pdf

Last Modified Date: Emmanuel Mbaru

Language: Emmanuel

Reference Type: Journal Article

Record Number: 37

Author: N. N. H. Kayanne, H. Iijima, T. R. McClanahan, S. K. Behera and T. Yamagata

Year: 2009

Title: Mode shift in the Indian Ocean climate under global warming stress

Journal: Geophysical Research letters,

Volume: Vol. 36, L23708

Short Title: Mode shift in the Indian Ocean climate under global warming stress

Alternate Journal: Japan Marine Science Foundation

Legal Note: Kenya

Abstract: A 115-year coral record from Kenya coast has been found to preserve the history of rainfall anomalies in East Africa in relation to global warming-induced Indian Ocean(IOD) variability. The coral IOD index demonstrates a dominant decadal periodicity in the early part of the 20th Century. This low frequency of IOD occurred more frequently before 1924 with mostly quasi-bianal ranging from 18 months to 3 years events since 1960. The mode shift has also coincided with intensification in the coupling with the Indian summer monsoon rainfall. It is suggested that warming of the western Indian Ocean, which has attenuated and replaced the El Nino/Southern Oscillation effect over the Indian Ocean, has driven the observed shift.

Notes: 6036

Language: English

Reference Type: Journal Article

Record Number: 38

Author: B. S. Newell

Year: 1959

Title: The hydrography of the East African coastal waters.

Volume: Publ. London No. 12:

Pages: pp18.

Type of Article: Research Report

Short Title: The hydrography of the East African coastal waters.

Legal Note: Kenya

Keywords: Hydrographic characteristics, Lamu, British East Africa, East African Coastal Current. Somali Current, Equatorial Counter Current, Monsoon, Salinity, Temperature

Abstract: Hydrographic characteristics of Kenya coastal water is presented based on stations observed during cruises made off Lamu in Kenya. The surface water, salinity and temperatures, salinity and currents are discussed for the southeast and northeast monsoon and believed to be depended on the surface water of the East Africa Coastal Current (EACC). Water of low salinity water arrives in East Africa in may to coincide with local fresh water due to river discharge. The source of the extra low salinity water is from Indonesia that arrives in Kenya three months. The position of the thermocline is also discussed.

Notes: 6037

Language: English

Reference Type: Journal Article

Record Number: 39

Author: M. M. Nguli

Year: 1994

Title: Water exchange and channel friction in Tudor creek, Kenya coast

Short Title: Water exchange and channel friction in Tudor creek, Kenya coast

Legal Note: Kenya

Keywords: Tudor creek, tidal current, temperature, salinity, heat flux, residence time and water exchange

Abstract: Temperature, salinity, tide and current measurements are used to study water exchange in Tudor Creek. The results show that M2 is the dominant tide with form number 0.18. Mean spring tidal range is 3.1m, typical flood and ebb lasts $0.36\text{m}^{-\text{s}}$ with volume flux $2500\text{m}^3\text{s}^{-1}$ and $0.4\text{m}^{-\text{s}}$ with a flux of $2700\text{m}^3\text{s}^{-1}$. Advective heat flux 6Wm^{-2} . The residence time is of the order of 2 weeks. It is concluded that the creek reveal interesting velocity asymmetry, however, there tidal symmetry was not apparent.

Notes: 6038

Language: English

Reference Type: Thesis

Record Number: 40

Author: M. M. Nguli

Year: 2006

Title: Water exchange and circulation in selected Kenyan creek

Short Title: Water exchange and circulation in selected Kenyan creek

Keywords: Tudor creek, Kilifi Creek, Gazi Bay, Offshore, tidal current, temperature, salinity, heat flux, residence time, water exchange, shelf water characteristics

Abstract: Three study sites 50km apart were selected in Kenya coast-Tudor Creek, Kilifi Creeks and Gazi Bay. Water exchange between the creeks and the ocean was determined from a seasonal heat budget, using temperature data from hydrographic observations and net heat fluxes from climatology data. Results show residence time for spring (neap) are 3(7) days, 2.5(6) days, 1(2.5) days for Tudor, Kilifi and Gazi respectively. Calculation based on Knudsen equations failed because of lack of good enough resolution on river discharge. Temperature and salinity differences between creeks and open sea averaged $T \sim 1^{\circ}\text{C}$, $S \sim 0.3^{\circ}\text{C}$ and were used to study the impact of the coastal ocean waters on the creek hydrography. It is revealed that there are two outstanding seasons, namely late NEM (during February) and the IMLR (April-May) in between which rapid changes take place in the coastal waters. February is dominated by hypersaline conditions in the inshore, low oceanic sea level, weak low frequency circulation (EACC) and the Somali current may appear on the coast (even subducted). May has estuarine conditions. When NEM weakens rapid increase in sea level together with rapid drop in salinity takes place occasioned by rainfall at the onset of IMLR. Strong correlation was found between steric height and development of the sea level. It is not clear whether the different seasons exert different effects on the water exchange. However, it is expected the IMLR season is more efficient in removing water exchange than NEM season because of high current velocities.

Notes: 6039

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 41

Author: M. M. Nguli, L. Rydberg, U. Cederlöf and D. Kirugara

Year: 2009

Title: Interaction between hydrography and tides of an ebb-dominated shallow water estuary-the Tudor Creek

Editor: J. Hoorweg and M. Nyawira

Book Title: African Studies Center

Publisher: African Studies Centre

Pages: 231-241

Chapter: 259

Short Title: Interaction between hydrography and tides of an ebb-dominated shallow water estuary-the Tudor Creek

ISBN: ISSN:1876-018X,

Section: Kenya

Keywords: Coastal ecology

Kenya coast

fish and fisheries

mangroves

conservation and management

rehabilitation and coastal processes

Notes: 6040

'File' Attachments: internal-pdf://Nguli_et_al[1]-4033728256/Nguli_et_al[1].pdf

Author Address: Kenya Marine and Fisheries Research Institute, Mombasa

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 42

Author: M. M. Nguli, L. Rydberg and J. Francis

Year: 2007

Title: Estimate of Water Residence Times in Tudor Creek, Kenya Based on Sea Surface Heat Fluxes and Observations of the Horizontal Temperature Gradient During Different Seasons.

Journal: Western Indian Ocean Journal of Marine Science

Volume: 5

Issue: 2

Pages: 163-178

Type of Article: Scientific Paper

Short Title: Estimate of Water Residence Times in Tudor Creek, Kenya Based on Sea Surface Heat Fluxes and Observations of the Horizontal Temperature Gradient During Different Seasons.

Legal Note: Kenya

Keywords: Tudor creek, Kenya

Water exchange

salinity

Temperature

Heat flux

Residence time

Abstract: Salinity and temperature measurements in Tudor Creek, Kenya (1995-98), river gauged data, data from the Kenya meteorological Department (KMD) and global climatology data were used to investigate water exchange between the creek and the adjacent Indian Ocean. KMD data was employed to estimate long-term rainfall, evaporation and river runoff. Observed salinity gradient appeared consisted with dry and rain periods, however, estimates of river runoff were not good enough for calculations based on salt conservation. Run-off in general was too small to give reliable rating curves. For this reason, heat conservation was used for the calculation of water exchange. Sea surface heat fluxes (50-150Wm⁻²) used gave surprising consistent results, with similar water exchange during all different seasons. Residence time for the creek was 3-5 days, 5days for the water inside the deep inlet. During spring tides, the exchange is about twice as large as during neap tides.

Notes: 6041

'File' Attachments: [internal-pdf://28508-16232-1-PB\[1\]-2936678656/28508-16232-1-PB\[1\].pdf](internal-pdf://28508-16232-1-PB[1]-2936678656/28508-16232-1-PB[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 43

Author: R. E. A. Okoola

Year: 1982

Title: Solar power potential in Kenya

Journal: Nairobi(KMD)

Type of Article: Research Report

Short Title: Solar power potential in Kenya

Legal Note: Kenya

Keywords: Solar, ITCZ, Mascarene plateau, pressure

Abstract: Solar power potential in Kenya is investigated. Movement of Inter-tropical Convergence Zone (ITCZ) due to the existence of pressure zones over the Mascarine Plateau and Asia to give rise to southeast and northeast monsoon winds is discussed.

Notes: 6042

Language: English

Reference Type: Journal Article

Record Number: 44

Author: D. R. Quardfasel and F. Schott

Year: 1982

Title: Water mass distribution at the intermediate layers off the Somali coast during the onset of the South West monsoon.

Journal: Journal Physical oceanography

Volume: 12, 1358-1352

Type of Article: Scientific Paper

Short Title: Water mass distribution at the intermediate layers off the Somali coast during the onset of the South West monsoon.

Legal Note: Kenya

Keywords: Hydrography, Somali Basin, water masses, mesoscale, Red sea water, Equatorial water

Abstract: Hydrographic observations at intermediate depth in the Somali Basin have been made during and after the transition from the northeast monsoon to the southwest monsoon, 1979. Earlier water-mass is confirmed and extended by introducing a well-defined Equatorial Water Mass. The distribution of water masses and its temporal evolution with the changing monsoonal wind field is analyzed on three different spatial scales. Equatorial and near-coastal undercurrents are an important factor in the large-scale redistribution of water masses in the intermediate layers. Cross-equatorial exchange of water, in particular highly saline Red Sea water, is largely confined to a narrow region off the East African Coast. No obvious response of these currents to the onset of the southwest monsoon is detected. In the mesoscale range anticyclonic subsurface eddies containing Equatorial Water are observed in the northern and southern Somali Basin. A possible formation mechanism of these features through equatorial westward subsurface jets is discussed. Double-diffusive intrusions with vertical scales of over 100 m are observed near strong fronts. Their characteristics compare well with theoretical predictions. A stability analysis for the upper and lower boundaries of these intrusions shows significantly that double-diffusive processes are acting also on these intrusions themselves.

Notes: 6043

Language: English

Reference Type: Thesis

Record Number: 45

Author: M. O. Odido

Year: 1994

Title: Tidal dynamics of Tudor Creek Mombasa Kenya

Short Title: Tidal dynamics of Tudor Creek Mombasa Kenya

Keywords: Tudor Creek, tides, Tidal constituents, Semi-diurnal tides

Abstract: Tidal constituents from tidal, temperature and current data are calculated for Tudor Creek, Kenya. Form ratio is also calculated. Circulation is found to be dominated by tidal currents. The dominant tides are semi-diurnal M2 type.

Notes: 6044

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 46

Author: S. Ragoonaden

Year: 2006

Title: Sea Level Activities and Changes on the Islands of the Western Indian Ocean

Journal: Western Indian Ocean J.Mar.Sci

Volume: Vol.5, No.2, pp.179-194

Type of Article: Scientific Paper

Short Title: Sea Level Activities and Changes on the Islands of the Western Indian Ocean

Legal Note: Kenya

Keywords: Western Indian Ocean, Sea level rise, GLOSS sea level stations, Island states, .

Abstract: Quality sea level data sets from 13 Island GLOSS stations in the Western Indian Ocean (WIO) and from Joint Archive for Sea level, located at the University of Hawaii were analyzed using linear regression and a 12-month moving average statistical method. Results showed that 8 out of the 13 stations indicated rising trend in sea level and four falling trend, a tendency illustrated also by TOPEX/Poseidon satellite data (1993-2000).The observation provides evidence that there is no clear indication of any great acceleration in sea level rise in WIO.

Notes: 6045

'File' Attachments: <internal-pdf://28509-16233-1-PB-1799077633/28509-16233-1-PB.pdf>

Language: English

Reference Type: Journal Article

Record Number: 47

Author: F. Schott and J. P. McCreary

Year: 2001

Title: The monsoon circulation of the Indian Ocean.

Journal: Progress in Oceanography

Volume: 51

Pages: 123.

Type of Article: Scientific Paper

Short Title: Prog. Oceanogr.

Legal Note: Kenya

Keywords: Indian ocean, Monsoon circulation, water masses.

Abstract: The monsoon circulation of the Indian Ocean was investigated. Temperature-Salinity diagrams are used to describe various water masses in the ocea. These are Bay of Bengal (BB), northern Arabian Sea (AS), equatorial region of western basin (EQ), South Equatorial Current (SEC), western exit of Indonesian Throughflow (ITF), Leeuwin Current (LC), Somali Current (SC), Circumpolar Deep Water (CDW), Indian Deep Water (IDW), Antarctic Intermediate Water (AAIW), Indian Central Water (ICW), Red Sea Water (RSW), Persian Gulf Water (PGW), and Arabian Sea Water (ASW)

Notes: 6046

Language: Ennglish

Reference Type: Journal Article

Record Number: 48

Author: G. R. Turyahikayo

Year: 1987

Title: Wave characteristics off the East African Coast,

Journal: Kenya Journal of Science (A Phys. Chem. Sci.).

Volume: 8

Issue: 1-2

Pages: 33-58.

Type of Article: Scientific Paper

Short Title: Wave characteristics off the East African Coast,

Legal Note: Kenya

Keywords: Wave, Nouttheast monsoon, Northeast monsoon,Characteristic wave height, Wave characteristics off the East African coast

Abstract: Sea and swell data collected by voluntary observing ships (VOS) plying the waters off the East African coast during January 1976-May 1977 and 1979-1982 are analysed.

Monthly/seasonal wave characteristics in the region bounded by latitudes 10 degree S and 10 degree N, longitude 52 degree E and the East African coastline are discussed. June/July was found to be roughest period while March/April and November were the calmest. The ships encountered mainly sea and swell waves of low and moderate significant heights, respectively, most of the time although very rough and high waves in excess of 6.0 m significant height were observed occasionally during the north-east monsoon and the south-west/south-east trades seasons. The roughest area was found to be off the north-east Somali coast during the south-west monsoon winds. The maximum of the average height of the 10% highest waves observed was 10.2 m in June. The distribution of wave indicates that despite the dominance of low sea and moderate swell waves, rough waves can still be encountered in most of the area during both monsoons.

Notes: 6047

'File' Attachments: internal-pdf://Turyahikayo33[1]-0157371141/Turyahikayo33[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 49

Author: T. John and H. K. Pedersen

Year: 2006

Title: KenSea Environmental Sensitivity Atlas for Coastal Area of Kenya

Type of Article: Resource Atlas Booklet

Short Title: KenSea Environmental Sensitivity Atlas for Coastal Area of Kenya

ISSN: ISBN 87-7871-191-6

Legal Note: Kenya

Keywords: Environmental sensitivity, coastal area,, coastal environment, coastal resources, oil-spill, Tourism

Abstract: Sensitivity Atlas and GIS database for Kenya coast was developed. It provides an environmental data dictionary to be utilized as a tool in risk assessment, clean up prioritization as well as a selection of appropriate methods and tools of response.

Notes: 6048

'File' Attachments: internal-pdf://kensea_rapport-2119747840/kensea_rapport.pdf

Language: English

Reference Type: Journal Article

Record Number: 50

Author: J. C. Swallow, F. Schott and M. Fieux

Year: 1991

Title: Structure and Transport of the East African Coastal Current

Journal: Journal of Geophysical Research

Volume: 93

Issue: 12

Pages: 22, 245-22,570

Short Title: J. Geophys. Res.

DOI: doi:10.1029/91JC01942

Legal Note: Kenya

Keywords: Oceanography: Physical: Western boundary currents, Oceanography: Physical: General circulation, Oceanography: Physical: Currents, Oceanography: General: Equatorial oceanography

Abstract: The East African Coastal Current (EACC) runs northward throughout the year between latitudes 11°S and 3°S, with surface speeds exceeding 1 m s⁻¹ in northern summer. Mean transport from five sections near 4°-5°S is 19.9 Sv (1 Sv≡106 m³ s⁻¹) northward in the upper 500 dbar, out to 120 km offshore. Below that, between 500 and 1000 dbar, there appears to be a weak variable transport of the order of 1 Sv. Comparing transports in the EACC with those in the boundary current north of Madagascar, it seems that most of the water in the upper 300 dbar of the northern branch of the South Equatorial Current goes into the EACC. Below 300 dbar there is an excess westward transport north of Madagascar which probably goes into the Mozambique Channel. At its northern end, in northern winter the EACC converges with the south-going Somali Current to form the Equatorial Countercurrent, with an eastward transport of about 22 Sv (0-300 dbar). In northern summer, the EACC merges into the north-going Somali Current.

Notes: 6049

'File' Attachments: internal-pdf://91JC01942[1]-3646523393/91JC01942[1].pdf

Author Address: Drakewalls, Gunnislake, Cornwall, England

Language: English

Reference Type: Journal Article

Record Number: 51

Author: UNEP

Year: 1998

Title: Eastern African Atlas of Coastal Resources. A project of the United Nations Environmental Programme with the support of the Government of Belgium..

Short Title: Eastern African Atlas of Coastal Resources. A project of the United Nations Environmental Programme with the support of the Government of Belgium..

Legal Note: Kenya

Keywords: Coastal resources, East Africa Atlas, Coastal Environment, management of the coast, sea grass, corals, fisheries ,aquaculture

Abstract: The resource map covers a corridor of 100km of the coast of Kenya and coastal and

marine environment. The map is expected to meet the demand of the policy makers, administrators, planners, developers, environmental resource managers, marine geologist and general public. It covers the coastal environment, coastal resources and their use and management of the coast.

Notes: 6050

'File' Attachments: internal-pdf://Kenyan Coastal Atlas-3926786560/Kenyan Coastal Atlas.pdf

Language: English

Reference Type: Journal Article

Record Number: 52

Author: P. N. Vinayachandran and R. S. Nanjundiah

Year: 2009

Title: Indian Ocean sea surface salinity variation in a coupled model

Journal: Climate Dynamics

Volume: 33

Issue: 2-3

Pages: 245-263

Type of Article: Journal Article

Short Title: Indian Ocean sea surface salinity variation in a coupled model

Legal Note: Kenya

Keywords: Indian Ocean

Salinity

Inter-annual variation

Coupled model

Indian Ocean

Dipole

Abstract: The variability of the sea surface salinity (SSS) in the Indian Ocean is studied using a 100-year control simulation of the Community Climate System Model (CCSM 2.0). The monsoon-driven seasonal SSS pattern in the Indian Ocean, marked by low salinity in the east and high salinity in the west, is captured by the model. The model overestimates runoff into the Bay of Bengal due to higher rainfall over the Himalayan-Tibetan regions which drain into the Bay of Bengal through Ganga-Brahmaputra rivers. The outflow of low-salinity water from the Bay of Bengal is too strong in the model. Consequently, the model Indian Ocean SSS is about 1 less than that seen in the climatology. The seasonal Indian Ocean salt balance obtained from the model is consistent with the analysis from climatological data sets. During summer, the large freshwater input into the Bay of Bengal and its redistribution decide the spatial pattern of salinity tendency. During winter, horizontal advection is the dominant contributor to the tendency term. The interannual variability of the SSS in the Indian Ocean is about five times larger than that in coupled model simulations of the North Atlantic Ocean. Regions of large interannual standard deviations are located near river mouths in the Bay of Bengal and in the eastern equatorial Indian Ocean. Both freshwater input into the ocean and advection of this anomalous flux are responsible for the generation of these anomalies. The model simulates 20 significant Indian Ocean Dipole (IOD) events and during IOD years large salinity anomalies appear in the equatorial Indian Ocean. The anomalies exist as two zonal bands: negative salinity

anomalies to the north of the equator and positive to the south. The SSS anomalies for the years in which IOD is not present and for ENSO years are much weaker than during IOD years. Significant interannual SSS anomalies appear in the Indian Ocean only during IOD years.

Notes: 6051

Language: English

Reference Type: Report

Record Number: 53

Author: C. Heip

Year: 1992-93

Title: R.V.Tyro Data Report of The Netherlands Indian Ocean Expedition

Type: Cruise report[Kenya Coast]

Short Title: R.V.Tyro Data Report of The Netherlands Indian Ocean Expedition

Keywords: M.V.Tyro, Cruise off Kenya coast, Data, salinity temperature, nutrients

Abstract: Partnership cruise aboard R.V. Tyro of the Netherlands took place in Kenya offshore water in June 1992 and December 1993, in an effort to study water characteristics of the coast water of kenyas.

Notes: 6052

Last Modified Date: Emmanuel mbaru

Language: English

Reference Type: Journal Article

Record Number: 54

Author: D. R. Johnson

Year: 1980

Title: Monsoon Experiment (MONEX) of 1979

Type of Article: Data Report

Short Title: Monsoon Experiment (MONEX) of 1979

Legal Note: Kenya

Keywords: Kenya continental shelf, Cruise, current profiles, perpendicular transects, data

Abstract: Data report is given for five transects taken off Kenya coast in 1979 using a local vessel M.V. Kusi from the Kenya Department Fishery. Salinity and temperature are collected from surface to bottom. Current speed and direction are taken from a current meter deployed along the coast. Some curves are available at the end of the data report.

Notes: 6053

'File' Attachments: <internal-pdf://00000208-2999477504/00000208.pdf>

Language: English

Reference Type: Journal Article

Record Number: 55

Author: T. R. McClanahan, S. M. McLaughlin, J. E. Davy, W. H. Wilson, E. C. Peters, K. L. Price and J. Maina

Year: 2004

Title: Observations of a new source of coral mortality along the Kenyan coast

Journal: Hydrobiologia

Volume: 530/531

Pages: 469-479

Type of Article: Journal Article

Short Title: Observations of a new source of coral mortality along the Kenyan coast

ISSN: 0018-8158.

Legal Note: Kenya

Keywords: *Astreopora*

Echinopora

coral disease

coral histology

marine fungi

Montipora

Abstract: In early 2002 coral mortality occurred along 600 km of coastline from Tanzania to Kenya. *Astreopora*, *Echinopora*, and *Montipora* species were severely affected, with *Montipora* being nearly eliminated from Kenyan reefs. *Acropora*, *Platygyra*, *Goniopora*, and massive *Porites* were also affected; however, *Porites* and *Goniopora* rarely died and often recovered, whereas death for most other species occurred within 2 weeks. In *Echinopora* and *Montipora*, a dull ashy tissue color and brittle skeletons characterized the early stages of this event with a mucus layer on the tissue surface in intermediate stages. Mucus and embedded debris then disappeared and surfaces were left covered in a white calcareous dust that sometimes capped a black layer. *Astreopora* tissues became dull and pale, and seldom produced mucus; eventually the skeleton became bare and white. Either a colorless translucent or brownish thin margin of tissue was visible between living tissue and bare skeleton, depending on species. Scanning electron micrographs of affected corals revealed the presence of fungi. Histology and staining showed that the fungi were mostly in the three genera that died from the syndrome and it may be that fungi invaded and killed corals weakened by another unidentified pathogen.

Notes: 6055

'File' Attachments: [internal-pdf://McClanaham\[1\]-3255240960/McClanaham\[1\].pdf](internal-pdf://McClanaham[1]-3255240960/McClanaham[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 56

Author: M. Piskorska, G. Smith and E. Weil

Year: 2007

Title: Bacteria associated with the coral *Echinopora lamellosa* (Esper 1795) in the Indian Ocean – Zanzibar Region

Journal: African Journal of Environmental Science and Technology

Volume: 1

Issue: 5

Pages: 093-098

Short Title: AJEST

Legal Note: Kenya

Keywords: Disease, coral reef, *echinopora*, Indian Ocean, white syndrome.

Abstract: Infectious diseases are now known to have major effects on the structure and function of coral reef ecosystems throughout the world. The number of recognized coral diseases has increased dramatically. The problem was first recognized in the Caribbean in the early 1970's but has now been reported to affect coral communities worldwide. There is little information regarding bacteria associated with diseased corals in the Indian Ocean. However, one of the most common disease signs observed is a rapid loss of tissue leaving exposed white skeleton in contact with compromised tissue, followed by necrosis. These signs have been referred to as white plague in the Caribbean. Similar signs have been observed in the Indo-Pacific and are referred to as white syndrome. The pathogens associated with these disease signs depend on the species and geographic location of the corals. In the Caribbean, the disease was associated with *Aurantimonas corallicida* and in the Red Sea with *Thalassomonas loyaeana*, both newly described species. During exploratory surveys in the reefs near Zanzibar in the Indian Ocean, mucus samples were collected from healthy and apparently diseased *Echinopora lamellosa* (with signs of white syndrome) colonies. Samples were plated on two solid media: GASW (nonspecific medium) and TCBS (*Vibrio* selective medium). Growth on TCBS was only found with diseased samples. Culturable isolates were characterized using metabolic profiling. A relatively high prevalence of Class Gamma Proteobacteria was found with diseased samples compared with healthy samples and *Vibrio* species were well represented in diseased samples.

Notes: 6056

'File' Attachments:

[internal-pdf://Piskorska%2520et%2520al\[1\]-0073728000/Piskorska%2520et%2520al\[1\].pdf](internal-pdf://Piskorska%2520et%2520al[1]-0073728000/Piskorska%2520et%2520al[1].pdf)

Language: English

Reference Type: Book Section

Record Number: 57

Author: D. Obura, I. Celliers, H. Machano, S. Mangubhai, M. S. Mohammed, H. Motta, C. Muhando, N. Muthiga, M. Pereira and M. Schleyer

Year: 2002

Title: Status of Coral Reefs in Eastern Africa: Kenya, Tanzania, Mozambique and South Africa

Short Title: Status of Coral Reefs in Eastern Africa: Kenya, Tanzania, Mozambique and South Africa

Section: Kenya

Keywords: Coral reefs, El Nino, Mortality, Recovery, Fungal disease, Management, East Africa.

Abstract: Eastern African coral reefs were severely impacted by the El Niño Southern Oscillation of 1997-98, with bleaching and mortality levels varying from <1% in South Africa to 80% and greater on reefs in northern Tanzania and Kenya. Recovery of affected reefs to 2002 has been poor to moderate, and patchy. Reefs strongly impacted by the El Niño that had high coral diversity and cover have recovered to less than one quarter of pre-bleaching coral cover. However, some high diversity reefs that escaped the bleaching impacts have remained healthy, with high coral cover and diversity. Degraded reefs outside Marine Protected Areas (MPAs) that were severely damaged by the El Niño have generally recovered to 50-100% of pre-bleaching coral cover. Recruitment of corals to reefs has also been moderate, with highest levels recorded on those protected reefs with high coral cover and diversity. In 2001-02, there has been

additional damage to Eastern African reefs from threats that may be related to climate-change, including floods in Mozambique, Harmful Algal Blooms in Tanzania and Kenya, and an unknown fungal disease of corals in Kenya and northern Tanzania. Anthropogenic threats to Eastern African reefs cited in the 1998 and 2000 global reports continue, including over-fishing, destructive fishing, pollution, and sedimentation from construction and coastal development, mining and shipping activities. Socio-economic studies of coral reefs are becoming increasingly common in Eastern Africa, and include the development of socio-economic monitoring under GCRMN. While socio-economic losses from coral mortality from the 1998 bleaching event were predicted, particularly in fisheries and tourism, these have not yet been seen. MPA management in the region has benefited from increased national and international attention. Improvements include further development of management plans, identification of priorities and tools for improving management, and increased networking among MPA sites, regional and international organizations, and countries. With regional increases in levels of co-management of MPAs and fisheries, there are expanding efforts to develop coral reef and fisheries monitoring programs that are community based and participatory, and that contribute to regional level reporting and assessments of coral reef condition.

Notes: 6057

'File' Attachments: <internal-pdf://scr2002-04-1294782976/scr2002-04.pdf>

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 58

Author: D. O. Souter, David; Linden, Olof

Year: 2000

Title: Coral reef degradation in the Indian Ocean. Status reports and project presentation 2000

Institution: CORDIO Project

Publisher: R. Submitted to the Proceedings of "International Symposium on the Extent of Coral Reef Bleaching", Kingdom of Saudi Arabia, February 2000

Short Title: Coral reef degradation in the Indian Ocean. Status reports and project presentation 2000

Keywords: Coral reef, Degradation, Bleaching, El Nino, Sea surface temperature, Indian Ocean

Abstract: The temperatures of the world's oceans are increasing at an accelerating rate. Recent estimates indicate that the magnitude of these increases might be as much as several degrees over the next century and undoubtedly, the impacts of these changes on the Earth's ecosystems are likely to become increasingly obvious. Coral reefs have already shown dramatic responses to the increasing ocean temperatures. Under normal temperature conditions, reef-building corals, which form the foundation of coral reefs, are living very near the maximum sea temperatures that they can tolerate. If they are exposed to even modest increases in sea temperatures, perhaps only 1° C - 2° C, they become stressed and often 'bleach'. This bleaching of corals is a response to stress, and it occurs when the symbiotic unicellular algae (zooxanthellae) that lives within the tissues of the coral polyp, are expelled or lost. The coral can survive for short periods without these zooxanthellae but unless the stress that caused the bleaching subsides and new zooxanthellae are incorporated into the tissue of the coral, the

coral will die. For several months in early 1998, the temperature of surface waters (< 10 m) over much of the world's tropical oceans increased between 3° C and 5° C. As a result, corals on reefs throughout the world bleached and, unfortunately, many died. The mortality of corals was particularly serious in the central and western Indian Ocean, where as many as 50% to 95% of all corals died.

Notes: 6058

'File' Attachments:

internal-pdf://CORDIO_Status_Report_2000[1]-0421536000/CORDIO_Status_Report_2000[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 59

Author: W. H. Wilson, I. Francis, K. Ryan and S. K. Davy

Year: 2001

Title: Temperature induction of viruses in symbiotic dinoflagellates

Journal: Aquatic Microbial Ecology

Volume: 25

Pages: 99–102

Short Title: Temperature induction of viruses in symbiotic dinoflagellates

Legal Note: Kenya

Keywords: Viruses, Anemones, Coral bleaching, Zooxanthellae, Latent infection

Abstract: Bleaching manifests itself as a loss of symbiotic dinoflagellates (zooxanthellae) and/or chlorophyll from a variety of symbiotic hosts, including corals and sea anemones. Bleaching is known to result from a range of environmental stresses, the most significant of which is elevated temperature; how these stresses elicit a bleaching response is currently the focus of intense research. One consequence of environmental stress that has yet to be considered is viral attack. Here, we have isolated a transferable infectious agent believed to be a virus, from zooxanthellae of the temperate sea anemone *Anemonia viridis*. The infectious agent is induced by elevated temperature. Once induced, the filterable agent can be further propagated without heat induction, thus fulfilling Koch's postulates. We propose that zooxanthellae harbor a latent viral infection that is induced by exposure to elevated temperatures. If such a mechanism also operates in the zooxanthellae harbored by reef corals, and these viruses kill the symbionts, then this could contribute to temperature-induced bleaching.

Notes: 6059

'File' Attachments: internal-pdf://Wilson01-2537802496/Wilson01.pdf

Language: English

Reference Type: Journal Article

Record Number: 60

Author: R. K. Jha and X. Zi-rong

Year: 2004

Title: Biomedical Compounds from Marine organisms

Journal: Marine Drugs

Volume: 2

Pages: 123-146

Short Title: Biomedical Compounds from Marine organisms

Reviewed item: Yes

Legal Note: Kenya

Keywords: Biomedical compounds, ocean, anti-cancer metabolite, anti-HIV metabolite

Abstract: The Ocean, which is called the 'mother of origin of life', is also the source of structurally unique natural products that are mainly accumulated in living organisms. Several of these compounds show pharmacological activities and are helpful for the invention and discovery of bioactive compounds, primarily for deadly diseases like cancer, acquired immuno-deficiency syndrome (AIDS), arthritis, etc., while other compounds have been developed as analgesics or to treat inflammation, etc. The lifesaving drugs are mainly found abundantly in microorganisms, algae and invertebrates, while they are scarce in vertebrates. Modern technologies have opened vast areas of research for the extraction of biomedical compounds from oceans and seas.

Notes: 6060

'File' Attachments:

internal-pdf://marinedrugs-02-00123-1891982080/marinedrugs-02-00123.pdf

Language: English

Reference Type: Report

Record Number: 61

Author: T. Dzaha

Year: 2004

Title: Novel Pharmaceuticals from Kenyan Cyanobacteria

Institution: Wiomsa

Publisher: M. p. w. 2004

Short Title: Novel Pharmaceuticals from Kenyan Cyanobacteria

Keywords: Cyanobacteria, Secondary metabolites, Lab cultures, therapeutic potential, Kenya

Abstract: Two projects undertaken at the Heriot-Watt University, Edinburgh, UK as part of the WIOMSA Marg II Programme are presented here. Project 1 was on studies carried out on the Kenyan marine cyanobacterium *Lyngbya majuscula*, which was collected from Shimoni, 100 km south of Mombasa, Kenya and ferried to the U.K on 12th October 2003. Specifically, *L. majuscula* was investigated on the potential for bioprocess intensified production of secondary metabolites with therapeutic potential, the Chemistry of its secondary metabolites and that of the cultures, and on the 16S rDNA classification of its epiphytic bacteria isolates. Project 2 focused on the isolation of cell-cell signaling inducer compounds from biofilms of marine bacteria *Bacillus licheniformis* EI-34-6.

Notes: 6061

URL: <http://www.oceandocs.org/bitstream/1834/1291/1/WIOMSAMARG-II200403TDZEHA.pdf>

'File' Attachments:

internal-pdf://WIOMSAMARG-II200403TDZEHA-2660370688/WIOMSAMARG-II200403TDZEHA.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 62

Author: C. Munga

Year: 2008

Title: Algal turf dominates Mombasa Marine Park and Reserve in Kenya, an implication of nutrient pollution

Publisher: VLIZ Special Publication,

Volume: 40: pp. 58

Pub Place: Kenya

Keywords: MPA, Monitoring, Algal turf, Eutrophication, Mombasa Marine Park & Reserve

Abstract: Mombasa Marine Park and Reserve is one of the Marine Protected Areas in Kenya established more than ten years ago. The Park is a no-take-zone, while the Reserve is a zone where regulated extractive uses such as artisanal fishing are allowed. Since the year 2004, ecological monitoring of the MPA has been going on aimed at generating information on the MPA status with a view to improve its management. Four year monitoring data (2004 to 2007) of percentage benthic cover using the Line Intercept Transect (LIT) method reveal relatively high average percentage turf could easily out compete and degrade the hard corals and sea grass beds that are important for MPA ecological and biological health status. The growth of algal turf is triggered by nutrient input mainly from land sources. It is therefore important to identify the nutrient input sources into the MPA so as to address management measures to remedy this ecological threat.

Notes: 6062

'File' Attachments: internal-pdf://132571[1]-2049371905/132571[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 63

Author: S. Bouillon, T. Moens and F. Dehairs

Year: 2004

Title: Carbon sources supporting benthic mineralization in mangrove and adjacent seagrass sediments (Gazi Bay, Kenya)

Journal: Biogeosciences

Volume: 1

Issue: 1

Pages: 71-78

Short Title: Carbon sources supporting benthic mineralization in mangrove and adjacent seagrass sediments (Gazi Bay, Kenya)

Legal Note: Kenya

Keywords: Carbon substrates, Bacterial communities, Sediment, Mangroves, Seagrass, Benthic mineralization, Gazi bay, Kenya.

Abstract: The origin of carbon substrates used by in situ sedimentary bacterial communities was investigated in an intertidal mangrove ecosystem and in adjacent seagrass beds in Gazi bay (Kenya) by delta super(13)C analysis of bacteria-specific PLFA (phospholipid fatty acids) and bulk organic carbon. Export of mangrove-derived organic matter to the adjacent seagrass-covered bay was evident from sedimentary total organic carbon (TOC) and delta super(13)C sub(TOC) data. PLFA delta super(13)C data indicate that the substrate used by bacterial communities varied strongly and that exported mangrove carbon was a significant source for bacteria in the adjacent seagrass beds. Within the intertidal mangrove forest, bacterial PLFA at the surface layer (0-1 cm) typically showed more enriched delta super(13)C values than deeper (up to 10 cm) sediment layers, suggesting a contribution from microphytobenthos and/or inwelled seagrass material. Under the simplifying assumption that seagrasses and mangroves are the dominant potential end-members, the estimated contribution of mangrove-derived carbon to benthic mineralization in the seagrass beds (16-74%) corresponds fairly well to the estimated contribution of mangrove C to the sedimentary organic matter pool (21-71%) across different seagrass sites. Based on the results of this study and a compilation of literature data, we suggest that trapping of allochthonous C is a common feature in seagrass beds and often represents a significant source of C for sediment bacteria - both in cases where seagrass C dominates the sediment TOC pool and in cases where external inputs are significant. Hence, it is likely that data on community respiration rates systematically overestimate the role of in situ mineralization as a fate of seagrass production.

Notes: 6063

'File' Attachments: [internal-pdf://Bouillon-2004-0685261568/Bouillon-2004.pdf](#)

Language: English

Reference Type: Journal Article

Record Number: 64

Author: J. Uku, M. Bjork, B. Bergman and B. Diez

Year: 2007

Title: Characterization and comparison of prokaryotic epiphytes associated with three East African seagrasses

Journal: Journal of Phycology

Volume: 43

Pages: 768-779

Short Title: Characterization and comparison of prokaryotic epiphytes associated with three East African seagrasses

Legal Note: Kenya

Keywords: Cyanobacteria, Diversity, Epiphytes, Nitrogen fixation, Phyllosphere, Seagrass.

Abstract: Prokaryotic epiphytes on leaves of three seagrass species, *Thalassodendron ciliatum*, *Thalassia hemprichii*, and *Cymodocea rotundata*, from two Kenyan coastal sites, Nyali (a high-nutrient site) and Vipingo (a low-nutrient site), were characterized genetically and morphologically. Denaturing gradient gel electrophoresis (DGGE) and clone libraries of PCR-amplified 16S rRNA gene fragments were used to study prokaryotes associated with these seagrasses. In general, the epiphytic coverage was greater in the high-nutrient site, while the microbial diversity was linked to seagrass species rather than the study sites.

Cytophaga–Flavobacteria–Bacteroides (CFB) were associated with *T. ciliatum* and *T. hemprichii* mainly in the nutrient-poor site, while α -, β -, and γ -proteobacteria were associated with all three species at the two study sites. Some bacteria phylotypes were closely related to sequences of microorganisms previously recovered from wastewaters or other contaminated sources, indicating the influx of land-based wastes into these coastal lagoon ecosystems. The abundance of potential nitrogen (N₂)-fixing cyanobacteria on *C. rotundata*, particularly in the low-nutrient site, suggested that this association may have been acquired to meet N demands. Unicellular cyanobacteria were dominant and associated with *C. rotundata* and *T. hemprichii* (with those on *T. hemprichii* being closely related to cyanobacterial symbiotic species), while *T. ciliatum* was almost devoid of cyanobacterial associations at the same site (Nyali), which suggests specificity in the cyanobacteria–seagrass associations. The abundance of prokaryotic epiphytes was considered to be linked to water depth and tidal exposure.

Notes: 6064

'File' Attachments: [internal-pdf://Uku2007\[1\]-3563059973/Uku2007\[1\].pdf](internal-pdf://Uku2007[1]-3563059973/Uku2007[1].pdf)

Language: English

Reference Type: Web Page

Record Number: 65

Author: K. Zengler, G. Toledo, M. Rappe, J. Elkins, E. J. Mathur, J. M. Short and M. Keller

Year: 2002

Title: Cultivating the uncultured

Publisher: National Academy of Sciences

Short Title: Cultivating the uncultured

Year Cited: Kenya

Date Cited: Primary Production

Keywords: Microorganisms, Diversity, Culture, Molecular phylogeny

Abstract: The recent application of molecular phylogeny to environmental samples has resulted in the discovery of an abundance of unique and previously unrecognized microorganisms. The vast majority of this microbial diversity has proved refractory to cultivation. Here, we describe a universal method that provides access to this immense reservoir of untapped microbial diversity. This technique combines encapsulation of cells in gel microdroplets for massively parallel microbial cultivation under low nutrient flux conditions, followed by flow cytometry to detect microdroplets containing microcolonies. The ability to grow and study previously uncultured organisms in pure culture will enhance our understanding of microbial physiology and metabolic adaptation and will provide new sources of microbial metabolites. We show that this technology can be applied to samples from several different environments, including seawater and soil.

Notes: 6065

URL: <http://www.pnas.org/content/99/24/15681.full.pdf+html>

'File' Attachments: <internal-pdf://Zengler-0958801665/Zengler.pdf>

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 66

Author: Z. Ansari

Year: 1984

Title: Macrofauna & Meiofauna of two sandy beaches at Mombasa, Kenya

Journal: Indian Journal of Marine Sciences.

Volume: 13

Pages: 187-189

Short Title: Macrofauna & Meiofauna of two sandy beaches at Mombasa, Kenya

Legal Note: Kenya

Keywords: Meiofauna, Macrofauna, Intertidal zonation, Sandy beaches, Mombasa, Kenya.

Abstract: Macrofauna and meiofauna of 2 sandy beaches at Mombasa, Kenya, having medium and fine sand particles, respectively, were investigated quantitatively. Macrofauna density was highest around high water mark and progressively decreased towards low water mark. Meiofauna density was highest around high water mark at English point, a more sheltered beach. On the more exposed Nyali Beach the meiofauna was aggregated down shore and highest numbers were recorded between mid and low water mark. On both beaches the meiofauna was dominated by nematodes followed by harpacticoid copepods.

Notes: 6066

'File' Attachments: internal-pdf://Ansari-1863440896/Ansari.pdf

Language: English

Reference Type: Journal Article

Record Number: 67

Author: S. Vanhove, M. Vincx, D. Van Gansbeke, W. Gijssels and D. Schram

Year: 1992

Title: The meiobenthos of five mangrove vegetation types in Gazi Bay, Kenya

Journal: Hydrobiologia

Volume: 247

Pages: 99-108

Type of Article: Journal Article

Short Title: The meiobenthos of five mangrove vegetation types in Gazi Bay, Kenya

ISSN: 0018-8158.

Legal Note: Kenya

Keywords: Meiobenthos

Mangroves

Distribution

Kenya

Abstract: The vertical distribution of meiofauna in the sediments of *Avicennia marina*, *Bruguiera gymnorrhiza*, *Cerriops tagal*, *Rhizophora mucronata* and *Sonneratia alba* at Gazi Bay (Kenya), is described. Seventeen taxa were observed, with highest densities in the sediments of *Bruguiera* (6707 ind. 10 cm⁻²), followed by *Rhizophora* (3998 ind. 10 cm⁻²), *Avicennia* (3442 ind. 10 cm⁻²), *Sonneratia* (2889 ind. 10 cm⁻²) and *Cerriops* (1976 ind. 10 cm⁻²). Nematodes accounted for up to 95 % of total densities; other common taxa were copepods, turbellarians, oligochaetes, polychaetes, ostracods and rotifers. High densities occurred to about 20 cm depth

in the sediment. Especially Ceriops sediments show still high densities of nematodes (342 ind. 10 cm⁻²) and copepods (11 ind. 10 cm⁻²) in the deepest layer (15-22 cm). Particle size and oxygen conditions were major factors influencing meiobenthic distribution; Uca burrows had a major impact on distribution and abundance of meiofauna.

Notes: 6067

'File' Attachments: internal-pdf://Vincx1992-0333952256/Vincx1992.pdf

Language: English

Reference Type: Thesis

Record Number: 68

Author: J. P. Okondo

Year: 1995

Title: Community structure and seasonal fluctuation of meiobenthos of the marine mangrove sediments at Gazi Bay, Kenya

City: Brussels

University: Free University Brussels MSc thesis

Degree: MSc

Thesis Type: MSc Thesis

Short Title: Community structure and seasonal fluctuation of meiobenthos of the marine mangrove sediments at Gazi Bay, Kenya

Keywords: Meiobenthos, Community structure, Seasonality, Gazi Bay, Kenya

Abstract: The meiobenthos of the *Avicennia marina* mangrove sediments was sampled monthly over 1 year (Aug 1992 – July 93). The community structure and abundance of meiofauna was analyzed each month to check for seasonality in composition. 18 major taxa were observed with most of them occurring in low densities. Nematoda was the dominant taxon (76-98%) followed by oligochaeta, turbellaria, Halachaloidea and rotifer. Harpacticoid copepoda, polychaeta and other taxa were insignificant with notable absence in some months. Total meiobenthos density ranged from 929 ind/10cm² in Dec 1992 to 10785 ind/10cm² in Mar 1993. A broad range of environmental factors were analyzed for correlation with fauna. Muddy detritus and Chlorophyll a showed significant seasonality. Nematoda had a slight correlation to sediment distribution but significant with chlorophyll a, an indication of possible food source.

Notes: 6068

'File' Attachments: internal-pdf://Okondo_MSc-3647230721/Okondo_MSc.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Thesis

Record Number: 69

Author: A. W. Muthumbi

Year: 1998

Title: Biodiversity of nematodes in the West Indian Ocean: Taxonomy and Assemblages.

City: Gent

University: University of Gent

Degree: PhD

Thesis Type: PhD Thesis

Short Title: Biodiversity of nematodes in the West Indian Ocean: Taxonomy and Assemblages.

Keywords: Meiofauna, Nematodes, Taxonomy, Assemblages, West Indian Ocean, Kenya, Tyro expedition

Abstract: During the Netherlands Indian Ocean Program (NIOP 1990-95), benthic sampling was carried out to assess among other things, meiofauna densities, sediment, community oxygen consumption and nematode assemblages. Four transects were sampled along the Kenya coast in the WIO region from north to south; Kiwayu, Tana, Sabaki and Gazi. Samples were taken during two seasons SEM (June/July) and onset of NEM (Nov/Dec) at depths of; 20m, 50m, 500m, 1000m and 2000m. The samples were taken using a box corer or lander. From each box, 2 subsamples were taken at a depth of 5cm using plastic core 2.6cm internal diameter, then mixed and fixed in hot 4% formaldehyde. In the lab, they were centrifuged in ludox and the nematodes were separated. Between 100 & 120 nematodes were picked and processed into slides and identified to genera. Genus composition and distribution for the 2 seasons were studied. From selected families, the individuals were identified to species and described. Species diversity estimates were done using Hills diversity & hierarchical. From 3 families, 42 new species were described and from 13 known species, additional information was provided.

Notes: 6069

'File' Attachments: internal-pdf://Muthumbi_PhD-1449361665/Muthumbi_PhD.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 70

Author: M. De Troch, D. Van Gansbeke and M. Vincx

Year: 2006

Title: Resource availability and meiofauna in sediment of tropical seagrass beds: Local versus global trends

Journal: Marine Environmental Research

Volume: 61

Pages: 59-73

Short Title: Resource availability and meiofauna in sediment of tropical seagrass beds: Local versus global trends

Legal Note: Kenya

Keywords: Meiofauna; Tropical; Seagrass; Sediments; Resources; Biodiversity Loss, alien invasive species,

Abstract: Characterisation of productivity–diversity relationships forms an essential step towards a better understanding of biodiversity. In terrestrial systems this is a topical subject and most studies reported a hump-shaped relationship. For marine systems, however, the number of studies dedicated to this is low despite the high interest in this productivity–diversity relationship. The present study reports on meiofauna density/diversity patterns in relation to resource

availability as an indicator for the productivity of the ecosystem. Standardised meiofauna samples were collected in tropical seagrass beds from three localities (Kenya, Mexico, the

Philippines) in order to contrast local patterns with a more global scale. Although these sites were physically comparable, a range of resource availabilities was found. These differences between localities were mainly due to different tidal regimes and related input of organic matter. At all sites a significant positive effect of resource increase on meiofauna densities was found. This positive effect was less clear for meiofauna diversity. Highest density and diversity levels were reported for the Kenyan site and this is probably linked to a high tidal range. Pooling all localities together resulted in a significant positive linear relationship between resource availability and meiofauna density/diversity. Caution should be taken when choosing resource indicators. Chlorophyll a concentrations, for example, resulted in a positive density–productivity

Notes: 6070

URL:

http://login.oaresciences.org/whalecomwww.sciencedirect.com/whalecom0/science?_ob=MI mg&_imagekey=B6V7H-4GNCGBW-1-C&_cdi=5843&_user=5062602&_pii=S014111360500045 0&_orig=browse&_coverDate=02%2F28%2F2006&_sk=999389998&view=c&wchp=dGLzVtz-zSk zS&md5=88e9e6a03ee141c936a13ddb995bbbbc&ie=/sdarticle.pdf

'File' Attachments: internal-pdf://sdarticle[5]-0965089536/sdarticle[5].pdf

Language: English

Reference Type: Journal Article

Record Number: 71

Author: M. De Troch, M. Raes, A. Muthumbi, H. Gheerardyn and A. Vanreusel

Year: 2008

Title: Spatial diversity of nematode and copepod genera of the coral degradation zone along the Kenyan coast, including a test for the use of higher-taxon surrogacy

Journal: African Journal of Marine Science

Volume: 30

Issue: 1

Pages: 25-33

Date: 2008

Short Title: Spatial diversity of nematode and copepod genera of the coral degradation zone along the Kenyan coast, including a test for the use of higher-taxon surrogacy

Legal Note: Kenya

Keywords: Copepods, coral degradation zone, Kenya, nematodes spatial diversity

Abstract: The biodiversity of meiofauna in the coral degradation zone along the Kenyan coast was examined with special emphasis on the most abundant taxa, Copepoda and Nematoda. Communities from three microhabitat types (coralline sediment, coral gravel and coral fragments) at two locations (Watamu and Tiwi Beach) were analysed. The total number of meiofaunal taxa was higher than in any other tropical coral degradation zone studied so far, but lower than in a cold-water coral degradation zone. Meiofaunal community composition was mainly structured on a local scale, although microhabitat type also had an effect in Watamu. Copepod and nematode communities exhibited comparable trends in biodiversity. The coralline sediment was generally characterised by a higher genus richness than the other microhabitats, and coral fragments were consistently low in evenness. Differential susceptibility to hydrodynamic disturbance is proposed as an explanation. Coral fragments contributed

considerably to the total diversity in terms of the number of nematode and copepod genera. It is therefore recommended to include this microhabitat in future biodiversity studies on tropical lagoons. Trends in bio diversity were similar for genera and families. The use of family-level identifications in fast screening and comparison of biological diversity is endorsed by this study.

Notes: 6071

'File' Attachments: internal-pdf://De Troch3-1444052224/De Troch3.pdf

Language: English

Reference Type: Journal Article

Record Number: 72

Author: J. Schrijvers, R. Schallier, J. Silence, J. Okondo and M. Vincx

Year: 1997

Title: Interaction between epibenthos and meiobenthos in a high *Avicennia marina* mangrove forest

Journal: Mangrove and Salt Marshes

Volume: 1

Pages: 137-154

Date: 1997

Type of Article: Journal Article

Short Title: Interaction between epibenthos and meiobenthos in a high *Avicennia marina* mangrove forest

Legal Note: Kenya

Keywords: *Avicennia marina*, epibenthos, Exclusion experiment, meiobenthos, Kenya.

Abstract: Many studies in the muddy intertidal zone of temperate regions have indicated meiofaunal communities to be mainly affected by epibenthic predation and disturbance rather than competition. Few studies, however, have dealt with mangrove sediments of tropical areas. In addition to a parallel study in a *Cerriops tagal* (Perr.) Rob. zone a manipulative exclusion technique was used to trace the dominant biological interactions structuring the meiobenthos of an East African *Avicennia marina* (Forsk.) Vierh. mangrove forest. The densities of the major meiobenthic taxa and nematode genera and a broad range of environmental factors were monitored over a depth profile for one year of caging. Cages (1 m²) excluded all epibenthos (> 2 mm) for one year and were procedurally controlled. Procedural and exclusion effects were traced, using a factorial and mixed ANOVA design. Significant exclusion effects were indicated for oligochaetes and for one of the dominant epibenthic feeding nematode genera. They are discussed in terms of epibenthic composition and density, feeding behaviour, food resources, and the abiotic environment. The conclusion is that the observed meiobenthos (especially oligochaetes and nematodes) is influenced mainly by exploitative or resource competition with the epibenthos. The common food source was indicated to be muddy detritus and microalgae. Consequently, the role of the meiobenthos is mainly situated in an isolated, detrital food web with only minor energy fluxes to the epibenthos.

Notes: 6072

'File' Attachments: internal-pdf://fulltext[1]-1447354880/fulltext[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 73

Author: M. De Troch, S. Gurdebeke, F. Fiers and M. Vincx

Year: 2001

Title: Zonation and structuring factors of meiofauna communities in a tropical seagrass bed (Gazi Bay, Kenya)

Journal: Journal of Sea Research

Volume: 45

Pages: 45-61

Short Title: Zonation and structuring factors of meiofauna communities in a tropical seagrass bed (Gazi Bay, Kenya)

Legal Note: Kenya

Keywords: Meiofauna; Zonation; Seagrass; Kenya continental shelf, Cruise, current profiles, perpendicular transects, data

Abstract: This study deals with the relation between tropical meiofauna and environmental variables by comparing the 'benthic' (i.e. in the bare sediment adjacent to seagrass plants) and the 'epiphytic' (i.e. in samples including seagrass plants) meiofauna associated with seagrass species from the high intertidal to the high subtidal zone in Gazi Bay (Kenya). Ordination and variance analysis revealed three distinct 'benthic' and two 'epiphytic' meiofauna assemblages. These assemblages corresponded entirely with those identified for the seagrass species: a high intertidal pioneer association (*Halophila ovalis*/*Halodule wrightii*), an intertidal climax assemblage (*Thalassia hemprichii*) and a high subtidal pioneer association (*Halophila stipulacea*/*Syringodium isoetifolium*). These data support the hypothesis that meiofaunal communities correspond to the characteristic zonation of the seagrass vegetation in Gazi Bay. In beds of the pioneer seagrass species, the close relationship between sediment characteristics and both 'benthic' and 'epiphytic' meiofauna communities suggests that these pioneer communities were mainly driven by physical factors. The 'benthic' communities adjacent to the climax seagrass species *T. hemprichii* were more structured by biogenic factors, e.g. % TOM, chlorophyll a and c, fucoxanthin, habitat complexity and growth form of the seagrass species. For its associated 'epiphytic' meiofauna the latter conclusion was even more striking. These data corroborate the importance of physical factors in disturbed environments (intertidal zone, near pioneer seagrasses) and of biotic factors in more stable conditions (subtidal zone, near climax seagrasses).

Notes: 6073

URL:

http://login.oaresciences.org/whalecomwww.sciencedirect.com/whalecom0/science?_ob=MI mg&_imagekey=B6VHH-42JYW69-5-R&_cdi=6067&_user=5062602&_pii=S138511010000551 &_orig=browse&_coverDate=02%2F28%2F2001&_sk=999549998&view=c&wchp=dGLzVlb-zSkz S&md5=837a25015130a6de78aaf05ec7f67b97&ie=/sdarticle.pdf

'File' Attachments: internal-pdf://sdarticle[1]-0511939840/sdarticle[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 74

Author: J. Schrijvers, J. Okondo, M. Steyaert and M. Vincx

Year: 1995

Title: Influence of epibenthos on meiobenthos of the Ceriops tagal mangrove sediment at Gazi Bay, Kenya.

Journal: Marine Ecology Progress Series

Volume: 128

Pages: 247-259

Short Title: Influence of epibenthos on meiobenthos of the Ceriops tagal mangrove sediment at Gazi Bay, Kenya.

Legal Note: Kenya

Keywords: Epibenthos, Meiobenthos, Interactions, Exclusive experiments, Abiotic factors, Mangrove sediments, Gazi bay, Kenya.

Abstract: A cage experiment was used to exclude the epibenthos from the Ceriops tagal mangrove sediment at Gazi Bay, Kenya. This made it possible to study interactions with the meiobenthos (in terms of predation, food competition and food enhancement). The density of the meiobenthic taxa and nematode genera and a broad range of abiotic variables were followed in a depth profile over 1 yr of caging. There was a significant exclusion effect in the upper sediment layer for total meiofauna, nematodes and oligochaetes during the first 2 mo and for copepods during the last 6 mo of caging. The density of the most common predatory and microalgae-feeding nematodes in particular tended to increase in the surface layers as well as the percentage of muddy detritus and pigment concentration. Food competition with the epibenthos seems to be most important in structuring the nematode community. This is suggested by the parallel exclusion effect on muddy detritus.

Notes: 6074

'File' Attachments: internal-pdf://Okondo et al-4150936577/Okondo et al.pdf

Language: English

Reference Type: Journal Article

Record Number: 75

Author: J. Schrijvers

Year: 1996

Title: Meiobenthos of Ceriops and Rhizophora mangroves at Gazi Bay, Kenya : human impact

Journal: Academiae Analecta

Volume: 58

Issue: 1

Pages: 99-114

Epub Date: 1996

Short Title: Meiobenthos of Ceriops and Rhizophora mangroves at Gazi Bay, Kenya : human impact

Legal Note: Kenya

Keywords: Meiobenthos, Density, Mangrove sediment, Nematodes, Feeding types, Ceriops tagal, Rhizophora mucronata, Gazi Bay, Kenya.

Abstract: The meiobenthos of the mangrove sediments of virgin Ceriops tagal and Rhizophora mucronata vegetations in Gazi Bay, Kenya, was examined. Higher taxa were counted and

Nematoda were determined to genus level. The composition of nematode feeding types was examined and nematode diversity, biomass and production were measured. Total meiofaunal densities were 3100 ind./10 cm² for *Cerriops tagal* and 6101 ind./10 cm² for *Rizophora mucronata*. In general, Gazi mangals had higher meiobenthic densities than other mangrove sediments described in literature. Nematodes were numerically dominant in both stations. *Rhizophora mucronata* sediment contained higher total, nematode and oligochaete densities and revealed a higher nematode diversity, biomass and production than *Cerriops tagal* sediment. Epistrate feeders and omnivore/predators were dominant in the nematode population of *Rhizophora mucronata* while deposit-feeding nematodes were more important in *Cerriops tagal*. These differences were related to the intertidal position of the respective sites reflected as a difference in amount of mud, sand and organic matter of the sediment. A comparison with two partially denuded sites of the same vegetation showed a decrease of total meiobenthos and nematodes and an increase of oligochaetes. This was probably due to the loss in the amount of organic material and mud caused by the thinning of the mangal.

Notes: 6075

Language: English

Reference Type: Journal Article

Record Number: 76

Author: M. Vincx and C. Heip

Year: 1991

Title: The use of meiobenthos in pollution monitoring studies: a review.

Journal: ICES Tech. Mar. Environ. Sci.

Volume: 16:

Pages: 50-67

Short Title: The use of meiobenthos in pollution monitoring studies: a review.

Legal Note: Kenya

Keywords: Pollution, Monitoring, Meiobenthos, Diversity, Nematode:Copepod (N:C)ratio, Distribution.

Abstract: The aim of many marine pollution monitoring programs is to study what happens with the living organisms when toxic wastes are dumped into the sea. These programs are often based on the knowledge of base line natural conditions in order to evaluate the extent of change caused by pollution. The potential of the meiobenthos (mainly nematodes and copepods) for monitoring is reviewed. Several methods for the detection of pollution induced disturbances have been proposed; they all take into account the changes observed in the structural aspects of the community caused by pollution: 1) taxon diversity of the meiofaunal components; 2) relative abundance of higher taxa of the meiobenthos (ratio nematode to copepod abundance); 3) species diversity of dominant taxa (indices, graphical methods); 4) species distribution patterns. It is very hard to distinguish pollution induced from natural changes, as in most cases the pre-pollution situation is not well known. Density in general is not much affected by pollution, whereas diversity generally seems to decrease. Pollution is often accompanied by general changes in sediment characteristics too; both the lethal effect of a pollutant or the change in habitat texture may be responsible for the observed changes. We know that some nematode species are resistant to high levels of pollution and anaerobiosis.

The effect of e.g. heavy metals on nematode population dynamics however, can only be studied in the laboratory. It is however concluded that our knowledge of the ecotoxicology of meiobenthos is still very poor and that much more work remains to be done.

Notes: 6076

Language: English

Reference Type: Journal Article

Record Number: 77

Author: M. De Troch, F. Fiers and M. Vincx

Year: 2001

Title: Alpha and beta diversity of harpacticoid copepods in a tropical seagrass bed : the relation between diversity and species' range size distribution.

Journal: Marine Ecology Progress Series

Volume: 215

Pages: 225-236

Date: 2001

Type of Article: Journal Article

Short Title: Alpha and beta diversity of harpacticoid copepods in a tropical seagrass bed : the relation between diversity and species' range size distribution.

Legal Note: Kenya

Keywords: Harpacticoid copepod, Seagraa, Diversity, Ecological range size

Abstract: Alpha and beta diversity of harpacticoid copepods was studied in a Kenyan seagrass bed (Gazi Bay, Kenya) with a clear zonation of different seagrass species. The application of an appropriate sampling strategy made the interpretation of different spatial diversity levels possible. Alpha diversity was defined as the diversity of harpacticoid copepods associated with 1 seagrass species or 1 subhabitat (roots or leaves). Beta diversity was interpreted as changes in diversity between both subhabitats of 1 seagrass species and between different seagrass species along the tidal gradient. A total of 115 harpacticoid copepod species were recorded in the seagrass samples. Of these, 36 species (31.3 %) were restricted to the root subhabitat and 12 (10.4%) were only recovered from leaf samples. Higher diversity was recorded for the deeper seagrass species (*Syringodium isoetifolium*, *Halophila stipulacea*). Copepod communities associated with *Halophila ovalis* and *H. stipulacea* (both pioneer seagrass species) were clearly different from one another in terms of diversity. A trend towards more specialized habitat preference (i.e. a lower ecological range size) was found with increasing diversity. The left-skewed species' range size distribution for the more diverse samples was clearly different from the typical right-skewed curves reported in most terrestrial studies. This may provide evidence for fundamental differences between marine species and terrestrial ones in their range size distribution.

Notes: 6077

'File' Attachments: internal-pdf://De Troch-1595165440/De Troch.pdf

Language: English

Reference Type: Journal Article

Record Number: 78

Author: M. De Troch, L. Vandepitte, M. Raes, E. Suarez-Morales and M. Vincx

Year: 2005

Title: A field colonization experiment with meiofauna and seagrass mimics: effect of time, distance and leaf surface area

Journal: Marine Biology

Volume: 148

Pages: 73–86

Type of Article: Journal Article

Short Title: A field colonization experiment with meiofauna and seagrass mimics: effect of time, distance and leaf surface area

Legal Note: Kenya

Keywords: Field experiment, Meiofauna, Seagrass mimic, Western Caribbean coast, Harpacticoid copepods.

Abstract: From a conservation point of view, it is essential to know how fast an ecosystem can recover after physical disturbance. Meiofauna and especially harpacticoid copepods are abundant in seagrass beds and are therefore useful to study ecosystem recovery after disturbance. In the western Caribbean coast, a fragmented *Thalassia testudinum* seagrass bed was selected to conduct a colonization field experiment by means of plastic seagrass mimics. Meiofauna colonization, with special emphasis on harpacticoid copepods, was followed in relation to: (1) colonization time (2, 4, 6, 10, 14 and 21 days); (2) distance to source of colonizers (close and far series) and (3) leaf surface area to colonize (small, medium, large). Colonization was recorded after 2 days with average meiofauna densities of 480 ind/100 cm² (close) and 1350 ind/100 cm² (far) of leaf surface area, while on average 400 ind/100 cm² were collected from the natural seagrass plants. In this early phase, the meiofauna diversity was high, with on average 8 taxa. A longer period of colonization (21 days) showed an increased meiofaunal density and diversity (average density: 3220 ind/100 cm², 13 taxa). Increasing meiofauna colonization with time is probably related to the development of a biofilm making the leaf more attractive for meiofauna. The effect of distance was not so pronounced as that of time. Total absolute densities were highest in the far series (5 m away from natural seagrass patch), mainly because of nematode densities. Meiofauna diversity was lower in the far series than in the close series (at the border of the natural seagrass patch). A larger individual leaf surface area did not affect the overall meiofauna densities but had a significant positive effect on copepod densities. Larger surface areas promoted the presence of epiphytic copepod families such as Tegastidae and Dactylopusiidae. Overall, we found a rapid recovery of meiofauna in fragmented seagrass beds with primary colonizers (both nematodes and benthic opportunistic copepods) originating from the sediment and later colonizers as epiphytic copepods and their nauplii from the local seagrass regeneration pool.

Notes: 6078

'File' Attachments: internal-pdf://De Troch4-0320032256/De Troch4.pdf

Language: English

Reference Type: Report

Record Number: 79

Author: G. K. Mwatha, E. Fondo, J. Uku and J. Kitheka

Year: 1998

Title: Biodiversity, Infauna, Food source, Mida Creek, Kenya

Series Title: Biodiversity of Mida Creek

City: Mombasa

Institution: KMFRI

Short Title: Biodiversity, Infauna, Food source, Mida Creek, Kenya

Keywords: Biodiversity, Infauna, Food source, Mida Creek, Kenya

Abstract: Mida creek was awarded biosphere reserve status by UNESCO in 1976 in recognition of its flora and fauna. In this multidisiplinary survey, a section was dedicated to shore birds and their prey. Macro and meiofauna sampling was done monthly during the low spring tide, simultaneously with the tidal flat bird counts. Perpendicular transects of about 100m apart were done from the mangrove edge to the low water mark with about 5 stations each. A greater proportion of the bird diet was benthivorous. Nematodes, polychaetes and oligochaetes formed the major part. Most of the fauna exhibited zonation patterns along the intertidal flat and some also exhibited seasonality in distribution.

Notes: 6079

Author Address: Kenya Marine and Fisheries Research Institute

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 80

Author: J. Schrijvers and M. Vincx

Year: 1997

Title: Cage experiments in an East African mangrove forest: a synthesis

Journal: Journal of Sea Research

Volume: 38

Pages: 123- 133

Short Title: Cage experiments in an East African mangrove forest: a synthesis

Legal Note: Kenya

Keywords: competition; predation; cage exclusion experiment; mangroves; Kenya; epibenthos; endobenthos

Abstract: The impact of epibenthos on endobenthos has frequently been investigated for temperate saltmarsh regions by using cage exclusion experiments. Although the insight into the function of the endobenthos of mangrove forests is crucial for their management, very few cage experiments have so far been carried out in such areas. The present paper summarises the results of such experiments in a typical East African mangrove forest at Gazi Bay about 60 km south of Mombasa,

Kenya. Epibenthic animals were excluded for one year in two mangrove zones which differed in forest morphology and intertidal position (*Ceriops tugal* and *Avicennia marina*). Environmental factors and meiobenthic and macrobenthic densities were followed in a randomised block design, and procedural and exclusion effects were statistically detected. In confronting the separate responses of all fauna groups in the two mangrove zones, this synthesis gives a better insight into the tropho-dynamical interactions than the earlier separate reports on the

same experiment. The ecosystem of the mangrove zones and the competitive interactions within this system provided an ideal opportunity to discover the existence of two food systems. This confirmed a strong involvement of the majority of the endobenthos in an isolated decompositional pathway in the mangrove sediment. It became clear that this exploitative competition was more important than the epibenthic predation in structuring and regulating the global endobenthic community. This synthesis therefore both demonstrates the decisive role of the endobenthos as regenerators of mangrove material, and suggests that endobenthos plays a minor role as prey for the demersal or pelagic carnivores.

Notes: 6080

'File' Attachments: internal-pdf://Schrijvers97[1]-1025232896/Schrijvers97[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 81

Author: A. W. Muthumbi, A. Vanreusel, G. Duineveld, K. Soetaert and M. Vincx

Year: 2004

Title: Nematode community structure along the continental slope off the Kenyan coast, western Indian Ocean

Journal: Internat. Rev. Hydrobiol

Volume: 89(2):

Pages: 188-205

Short Title: Nematode community structure along the continental slope off the Kenyan coast, western Indian Ocean

Legal Note: Kenya

Keywords: Continental slope, marine nematodes, density, genera composition, Kenyan coast.

Abstract: Metazoan meiofauna and in particular nematode densities, diversity, community structure were studied in relation to water depth (20 m, 50 m, 500 m, 1000 m and 2000 m) along four bathymetric transects in the Western Indian Ocean off the Kenyan coast. Nematode densities ranged, between, 276-944, Ind /10cm², which is comparable to values from other oligotrophic areas in the world. Densities was correlated with oxygen concentrations in the overlying water, since they were lowest at mid-depth (500-1000 m) coinciding with the minimum oxygen level. Nematode community structure (at genus level) resembles communities found in temperate slope regions, which are also characterized by a low productivity. The community structure showed correlations with sediment composition, water depth and oxygen levels in the overlying water. Sediment composition was mainly important at the shelf where nematodes separated into a silty sediment dwelling community with high abundances of Daptonema, Dorylaimopsis, Terschellingia and, Halalaimus and a sandy sediment-dwelling community characterised by high abundances of Microlaimus and Halalaimus. The genera Monhystera, Acantholaimus, Sabatieria, Molgolaimu, and Halalaimus dominated the slope communities. The characteristic deep-sea taxa, the monhysterids and Acantholaimus increased in relative abundance with increasing depth to become dominant at the lower slope (2000 m). The upper (500 m) and mid-slope (1000 m), which coincided with the lowest oxygen concentrations, were colonised by Sabatieria, a genus that is known to inhabit suboxic sediments. Diversity at the level of the genera showed

a unimodal trend along the sampled gradient, with highest values at mid-depth (500 m). Although the oxygen minimum at mid depths is much less pronounced than in adjacent areas, the results of this study suggest an impact on the present communities.

Notes: 6081

'File' Attachments: [internal-pdf://72210\[1\]-0221728001/72210\[1\].pdf](internal-pdf://72210[1]-0221728001/72210[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 83

Author: D. Verschelde and M. Vincx

Year: 1993

Title: Draconematidae (Nematoda, Desmodoroidea) from the Coast of Kenya, East Africa.

Journal: Med. K. Belg. Inst. Nat. Wet

Volume: 63

Pages: 35-53

Short Title: Draconematidae (Nematoda, Desmodoroidea) from the Coast of Kenya, East Africa.

Legal Note: Kenya

Keywords: Draconematidae, Species description, Additional information, Intertidal beaches, Kenya

Abstract: Six species of the family Draconematidae from the intertidal zone of the beaches of Gazi and Malindi, Kenya, are described or provided with additional information. *Dracognomus annae* sp. n. is characterized by its round rostrum, and by the shape of the male spicules; *Dracognomus dermatoglyphus* sp. n. is characterized by its indented rostrum, the fingerprint-like pattern of the annules at the mid-body region, and males by their spicules with hook-shaped capitulum; *Dracograllus gilbertae* sp. n. is characterized by its large fovea amphidialis, its slender posterior adhesion tubes, and a ventral post-cloacal swelling at the base of the tail. Only one female and one juvenile was found of a *Dracograllus* spec. Additional characteristics are described for *Dracograllus demani* Allen and Noffsinger, 1978 and *Dracograllus eira* (Inglis, 1968) Allen and Noffsinger, 1978. For most of the species, scanning microscopic pictures are shown.

Notes: 6083

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Language: English

Reference Type: Journal Article

Record Number: 84

Author: D. Verschelde and M. Vincx

Year: 1993

Title: *Polkepsilonema mombasae* gen. et sp. n. and *Pternepsilonema servaesae* gen. et sp. n. (Nematoda, Epsilonematidae) from East African coasts

Journal: Hydrobiologia

Volume: 257

Pages: 129-142

Type of Article: Journal Article

Short Title: *Polkepsilonema mombasae* gen. et sp. n. and *Pternepsilonema servaesae* gen. et sp. n. (Nematoda, Epsilonematidae) from East African coasts

ISSN: 0018-8158.

Legal Note: Kenya

Keywords: Taxonomy

Diagnosis (taxonomy)

Morphology

Morphometry

Taxonomic key

New species

New genus

East Africa

Abstract: Two new genera and species from Kenyan tidal areas, *Polkepsilonema mombasae* gen. et sp.n. and *Pternepsilonema servaesae* gen. et sp.n., are described. Both are characterized by the presence of at least fourteen subcephalic setae and by thick thorns on the ventral body region of males. In the first genus, eight to ten subcephalic setae are situated anterior to the amphid, and the ambulatory setae are bisinuous. In the second, the subcephalic setae are situated at the posterior edge of the rostrum, and the ambulatory setae are straight. A key to the 13 genera of the Epsilonematidae is presented.

Notes: 6084

'File' Attachments: <internal-pdf://Verschelde129-3051645696/Verschelde129.pdf>

Language: English

Reference Type: Journal Article

Record Number: 85

Author: D. Vershelde and M. Vincx

Year: 1996

Title: Four new species of the family Desmodoridae (Nematoda, Desmodoroidea) from Kenya.

Journal: Zoologica Scri

Volume: 25

Pages: 1-20

Short Title: Four new species of the family Desmodoridae (Nematoda, Desmodoroidea) from Kenya.

Legal Note: Kenya

Keywords: Desmodoridae, New species, Description, Coral sand, Intertidal, Kenya.

Abstract: *Chromaspirina vanreuselae* sp. n., *Zalonema myrianae* sp. n., *Echinodesmodora moensi* sp. n., and *Metachromadora (Bradyaimus) nyalii* sp. n. are described from coarse coral sands in the intertidal zone of beaches along the Kenyan coast. In *Chromaspirina vanreuselae* sp. n., 15 cheilorhabdia (instead of 12 which is typical for the *Chromadorina*) are found in the cheilostome. *Zalonema* Cobb, 1920, is restored to the genus level. Comments are given on the term 'head region', and on ontogenetic transformations of some morphological characters, such as amphidial shape, presence, number and position of subcephalic setae, and tail shape.

Notes: 6085

'File' Attachments:

internal-pdf://verschelded_etal_1996-01[1]-1390824192/verschelded_etal_1996-01[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 86

Author: A. V. Muthumbi, M.

Year: 1996

Title: Nematodes from the Indian Ocean: description of six new species of the genus *Molgolaimus* Ditlevsen, 1921 (Nematoda: Desmodoridae)

Journal: Med. K. Belg. Inst. Nat. Wet

Volume: 66:

Pages: 17-28

Short Title: Nematodes from the Indian Ocean: description of six new species of the genus *Molgolaimus* Ditlevsen, 1921 (Nematoda: Desmodoridae)

Legal Note: Kenya

Keywords: *Molgolaimus*, New species, Description, Indian Ocean.

Abstract: Six new species of the genus *Molgolaimus* Ditlevsen, 1921 are described from the Indian Ocean. *Molgolaimus abyssorum* n. sp. is characterised by a small body ($L = 287-370 \mu\text{m}$), amphids close to the anterior end ($2-3 \mu\text{m}$ behind the anterior end), short ($2 \times \text{abd}$) curved spicules and absence of pre-cloacal supplements. *Molgolaimus tyroi* n. sp. is characterised by a small body size ($L = 225-290 \mu\text{m}$), amphids close the anterior end ($2 \mu\text{m}$ behind anterior), long thin spicules curved twice and one or two pre-cloacal supplements. *Molgolaimus gazii* n. sp. is characterised by narrow anterior end with the head region slightly offset, wide amphids ($70\% \text{cbd}$) located at $2.6-3.0 \times \text{hd}$ behind the anterior end, thin, long spicules with anterior one third parallel to the body axis and posterior two thirds of its length curved. *Molgolaimus sabakii* n. sp. is characterised by narrow anterior end, sexual dimorphism in size of amphids [wide amphids in males ($70-80\% \text{cbd}$), smaller ones in females ($55\% \text{cbd}$)] located at $17-20 \mu\text{m}$ ($3.4-4.0 \times \text{hd}$) behind the anterior end, thin long spicules which have anterior half parallel to the body axis and the posterior half curved and two ventral pre-cloacal supplements located within the spicule region. *Molgolaimus kiwayui* n. sp. is characterised by head region off set by a constriction, amphids located close to anterior end ($1.0-1.5 \times \text{hd}$ behind the anterior end), short slightly curved spicules with capitulum. *Molgolaimus tanai* n. sp. is characterised by cephalic setae ($2-3 \mu\text{m}$ long) located at $5-6 \mu\text{m}$ behind the anterior end, amphids located at $7-9 \mu\text{m}$ behind the anterior end, long slender spicules ($3.8-5.1 \text{abd}$ long) and a complex gubernaculum with lateral pieces.

Notes: 6086

Language: English

Reference Type: Journal Article

Record Number: 87

Author: A. Muthumbi, K. Soetaert and M. Vincx

Year: 1997

Title: Deep sea nematodes from the Indian Ocean: New and known species of the family

Comesomatidae.

Journal: Hydrobiologia

Volume: 346

Pages: 25-57

Type of Article: Journal Article

Short Title: Deep sea nematodes from the Indian Ocean: New and known species of the family Comesomatidae.

ISSN: 0018-8158.

Legal Note: Kenya

Keywords: Nematoda

Comesomatidae

deep sea

Indian Ocean

Abstract: Twelve new and known species of the genera *Sabatieria*, *Cervonema*, *Paramesonchium*, *Hopperia* and *Dorylaimopsis* and one new genus, *Kenyanema* are described from the Indian Ocean and *S. pisinna* Vitiello, 1970 from the Mediterranean Sea. *Sabatieria lucia* sp. n. is characterised by short but distinct inner and setiform outer labial sensilla and long (4-5 μm or 30-33% hd) cephalic sensilla; *S. conicauda* Vitiello, 1970, is characterised by tiny inner and outer labial sensilla and setiform cephalic ones and short and thick cylindrical tail; *Sabatieria pisinna* is characterised by short inner and outer labial sensilla, setiform (3 μm long) cephalic sensilla, multispiral amphids with 3.25-3.5 turns and a tail which is conical in the anterior 2/3 and posterior 1/3 cylindrical; *Cervonema tenuicauda* Schuurmans Stekhoven, 1950, is characterised by anterior sensilla in two circles which are equal in length (3 μm long), multispiral amphids with 3-4 turns and located at 1.5 times hd from the anterior end, simple spicules one abd long and 6-7 fine precloacal supplements; *Cervonema minutus* sp. n. characterised by an extremely attenuated anterior end, spiral amphids with 4-5 turns (80-90% cbd) and short, simple spicules (0.8 abd long); *Cervonema goubaulti* sp. n. characterised by long (4-5 μm) labial and cephalic sensilla, spiral amphids with 5-6 turns (73-88% cbd) and an elongate crenate terminal pharyngeal bulb; *Paramesonchium mombasi* sp. n. characterised by long labial (5 μm) and cephalic (21 μm) sensilla that are close together and wide amphids (80-90% cbd); *Kenyanema monorchis* gen. et sp. n. characterised by a head region narrower than the rest of the body, four cephalic sensilla (3 μm long) and spiral amphids with 1.5-2 turns; *Hopperia indiana* sp. n. characterised by shea conical anterior sensilla, arcuate spicules that have a 'velum' and a gubernaculum with a long and sharp pointed apophysis; *Dorylaimopsis coomansi* sp. n. characterised by long (8-10 μm) cephalic setae, cuticular punctation with lateral differentiation of irregularly arranged dots at the pharyngeal region and 1-3 longitudinal rows of dots posterior of the pharynx; spicules with a unique shape; *Dorylaimopsis gerardi* sp. n. characterised by short setiform labial and long (6-7 μm) cephalic sensilla, punctated cuticle with lateral differentiation of irregularly arranged dots at first then three or four irregularly arranged longitudinal rows at the pharyngeal and tail regions and two regularly arranged longitudinal rows of dots on the rest of the body, a conico-cylindrical tail with a distinctly swollen tip; *Dorylaimopsis variabilis* sp. n. is characterised by short labial and setiform cephalic sensilla (33-58% hd), multispiral amphids with three turns, cuticular punctations with lateral differentiation of three longitudinal rows at the pharyngeal and tail regions and two

longitudinal rows on the rest of the body, spicules that are thin and slightly arcuate. The position of *S. pisinna* according to the grouping of Platt, 1985 of *Sabatieria* spp. is also discussed. *Kenyanema monorchis* represents the first monorchic species in the family.

Notes: 6087

'File' Attachments: <internal-pdf://Muthumbi-2265328384/Muthumbi.pdf>

Language: English

Reference Type: Journal Article

Record Number: 88

Author: A. Muthumbi and M. Vincx

Year: 1997

Title: *Acantholaimus* (chromadoridae:nematoda) from Indian Ocean: description of seven species

Journal: *Hydrobiologia*

Volume: 346

Pages: 59-76

Short Title: *Acantholaimus* (chromadoridae:nematoda) from Indian Ocean: description of seven species

Legal Note: Kenya

Keywords: *Acantholaimus*, New species, Description, Indian Ocean.

Abstract: Seven species of the *Acantholaimus* are described. *Acantholaimus vermeuleni* sp.n. is characterised by labial and cephalic sensilla that are located at the same level, two post amphidial setae on the dorso-lateral side and a poorly developed stoma without distinct teeth. *Acantholaimus verscheldi* sp.n. is characterised by a narrow elongate pharyngeal region, a long stoma with distinct teeth and short (4-7 µm) cephalic sensilla. *Acantholaimus heipi* sp.n. is characterised by a narrow elongate pharyngeal region, well developed teeth in the stoma and long cephalic sensilla (11-13 µm). *Acantholaimus elegans* Jensen 1988 has a narrow anterior pharyngeal region that increases in width posteriorly, it has setae before and after the amphids on both sides and stoma with well developed teeth. *Acantholaimus gathumai* sp.n. is characterised by long cephalic (10-15 µm) and somatic (8-10 µm) setae and lateral differentiation with fine dots (5-7 µm in width). *Acantholaimus geraerti* sp.n. has long cephalic sensilla (15-19 µm) and narrow (4-6 µm) distinct lateral differentiation. *Acantholaimus invaginatium* sp.n. is characterised by very long cephalic setae (16-21 µm), several setae at the pharyngeal region and wide lateral differentiation with fine dots, often the stoma is invaginated.

Notes: 6088

'File' Attachments: <internal-pdf://Muthumbi-3009440000/Muthumbi.pdf>

Language: English

Reference Type: Journal Article

Record Number: 89

Author: A. Muthumbi and M. Vincx

Year: 1997

Title: Chromadoridae (Chromadorida: Nematoda) from the Indian Ocean: description of new

and known species

Journal: Hydrobiologia

Volume: 364

Issue: 2

Pages: 119-153

Type of Article: Journal Article

Short Title: Chromadoridae (Chromadorida: Nematoda) from the Indian Ocean: description of new and known species

ISSN: 0018-8158.

Legal Note: Kenya

Keywords: Marine nematodes

Chromadoridae

Indian Ocean

Abstract: Seventeen new and known species of the family Chromadoridae are described. The genus *Dichromadora* is represented by five species. *Dichromadora longicaudata* sp.n. is characterised by a slender body and thin long tail; *Dichromadora gathuai* sp.n. is characterised by a blunt anterior end, a raised lateral alae and a gubernaculum that is serrated on the posterior end; *D. loiseae* sp.n. is characterised by a blunt anterior end with a raised collar, double bulb, spicules with a poorly developed capitulum and seven pre-cloacal supplements; *D. cucullata*, Lorenzen, 1973 is characterised by lateral differentiation of two (four?) longitudinal rows of dots, seven pre-cloacal supplements and spicules with a rounded capitulum that is open at the tip; *D. quadripapillata* sp.n. is characterised by a cylindrical body with an elongate tail end, two (four?) longitudinal rows of dots, anterior pharyngeal region with two pairs of setae, spicules with poorly developed capitulum and four (1+3) pre-cloacal supplements. *Hypodontolaimus* genus has two species. *Hypodontolaimus marleenae* sp. n. has short (2 µm long) outer labial and long (18 µm long) cephalic sensilla; punctated cuticle with two longitudinal rows of dots, spicules with poorly developed capitulum and eight fine pre-cloacal supplements; *Hypodontolaimus* aff. *angelae* Inglis, 1961 is characterised by three somatic setae at the anterior pharyngeal region, a large hollow dorsal tooth, a well-developed posterior pharyngeal bulb and a beak-shaped capitulum. The genus *Ptycholaimellus* has three species. *Ptycholaimellus macrodentatus* Timm, 1961 is characterised by a blunt anterior end, papilliform outer labial and setiform (6–8 µm long) cephalic sensilla, spicules bent at the anterior end and a short stout gubernaculum that is sharp-pointed and hooked on the posterior end; *Ptycholaimellus penninae* sp.n. is characterised by a blunt anterior end, inconspicuous labial sensilla and 5 µm long cephalic sensilla, a curved spicules with poorly developed capitulum and a gubernaculum that is serrated on the posterior tip; *Ptycholaimellus ponticus* Filipjev, 1922 is characterised by blunt anterior end, poorly developed vestibulum, inconspicuous labial sensilla and 3 µm long cephalic sensilla, curved spicules with poorly developed capitulum and a simple gubernaculum. *Ptycholaimellus ponticus* sensu Gerlach, 1951 is given a new name, *P. jenseni* sp. n. The genus *Trochamus* Boucher and Bovée, 1971 is represented by four species. *Trochamus bulbosa* sp. n. is characterised by a small plump body normally thicker at the mid-body especially in gravid females, annulated and punctated cuticle with a lateral differentiation that is a raised ala, prominent labial rugae, long, slender spicules and conical cylindrical tail. *Trochamus complexus* Boucher, 1976 is characterised by cylindrical body swollen at the middle,

annulated and punctated cuticle with a raised lateral alae, faint circular amphids, small stoma, thin slender spicules and elongate cylindrical tail. *Trochamus prosoporus* Blome, 1985 is characterised by rather long body (>1 mm long), with a blunt anterior end and cylindrical tail end, raised lateral alae, stoma with a large dorsal tooth, curved massive spicules and a gubernaculum with sharp posterior tip. *Trochamus polki* sp. n. is characterised by cylindrical body with a blunt anterior end and cylindrical tail end, raised lateral alae, prominent labial rugae, open loop-shaped amphids and in female the vagina wall is very refractive. *Prochromadorella* Mickoletzky, 1924 has two species. *Prochromadorella daroae* sp. n. is characterised by a slender body attenuating on both ends, heterogeneous cuticle without lateral differentiation, curved spicules with a poorly developed capitulum and no pre-cloacal supplements. *Prochromadorella ditlevseni* (de Man, 1922), Lorenzen, 1971 is characterised by a slender body, heterogeneous cuticle without lateral differentiation, thin curved spicules and five pre-cloacal supplements. The genus *Trichromadora* Kreis, 1929 is re-instated and *T. longicaudata* Kreis, 1929 is redescribed. It is characterised by a slender body and a long tail, cuticle with lateral differentiation of three longitudinal rows of dots throughout the body length, massive spicules with a poorly developed capitulum and five pre-cloacal supplements.

Notes: 6089

'File' Attachments: [internal-pdf://Hydrdo364_119\[1\]-0490067457/Hydrdo364_119\[1\].pdf](internal-pdf://Hydrdo364_119[1]-0490067457/Hydrdo364_119[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 90

Author: A. Muthumbi and M. Vincx

Year: 1998

Title: Chromadoridae (Chromadorida: Nematoda) from the Indian Ocean: difficulties in morphological identification of *Actinonema* Cobb, 1920 and *Rhips* Cobb, 1920

Journal: *Hydrobiologia*

Volume: 364

Pages: 155-167

Type of Article: Journal Article

Short Title: Chromadoridae (Chromadorida: Nematoda) from the Indian Ocean: difficulties in morphological identification of *Actinonema* Cobb, 1920 and *Rhips* Cobb, 1920

ISSN: 0018-8158.

Legal Note: Kenya

Keywords: *Actinonema*

Rhips

Diagnosis

Morphological

Characteristics

Abstract: The diagnostic characteristics of *Actinonema* Cobb, 1920 and *Rhips* Cobb, 1920 are reviewed and their importance for genera diagnosis assessed. Three species of *Actinonema* and one species of *Rhips* are described. *Actinonema longicaudatum* Steiner, 1918 is characterised by short (2–3 µm long) anterior sensilla, cylindrical body with a rather narrow anterior end, lateral alae with inverted 'V'-patterns, wide (70–75 of cbd) double amphids and accessory

pieces composed of only the telamon which is broad anteriorly and tapers on the posterior and a long tail. *Actinonema paraceltica* is characterised by long (4–5 µm) anterior sensilla, large amphids (83–88% of cbd), lateral differentiation of 'V' pattern on each annule and accessory pieces with telamons that have short extensions. *Actinonema smolae* sp. n. is characterised by long and thin body, large amphids located close to the anterior end and six solid cones. *Rhyps reginae* n.sp. is characterised by six solid cones, large (90% cbd) amphids, lateral differentiation of two longitudinal rows of dots and double jointed spicules.

Notes: 6090

'File' Attachments: [internal-pdf://Hydrdo364_155\[1\]-2972997121/Hydrdo364_155\[1\].pdf](internal-pdf://Hydrdo364_155[1]-2972997121/Hydrdo364_155[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 91

Author: A. Muthumbi and M. Vincx

Year: 1999

Title: Microlaimidae (Microlaimoidea: Nematoda) from the Indian Ocean: description of nine new and known species

Journal: Hydrobiologia

Volume: 397

Pages: 39-58

Type of Article: Journal Article

Short Title: Microlaimidae (Microlaimoidea: Nematoda) from the Indian Ocean: description of nine new and known species

ISSN: 0018-8158.

Legal Note: Kenya

Keywords: Nematodes

Microlaimidae

deep sea

Indian Ocean.

Abstract: Nine species are described from the genera *Aponema* Jensen, 1978, *Bolbolaimus* Cobb, 1920, *Calomicrolaimus* Lorenzen, 1976, *Ixonema* Lorenzen, 1976 and *Microlaimus* de Man, 1880. *Aponema decraemerae* sp. n. is characterised by sexual dimorphism in the size of the amphids, short cephalic sensilla, spicules with a poorly developed capitulum and conical cylindrical tail with a pointed tip. *Aponema mnazi* sp.n. is characterised by short cephalic sensilla, head set off from the rest of the body by a fine constriction, spicules with a pointed anterior tip, one precloacal supplement located at 7 µm from the cloaca opening and a short tail with a blunt tip. *Bolbolaimus bahari* sp. n. is characterised by cuticular annules with fine interannular spaces, papilliform labial sensilla and short setiform cephalic ones, curved spicules with a poorly developed capitulum. *Bolbolaimus abebai* sp.n. is characterised by setiform outer labial and cephalic sensilla and spicules with a well-developed beak shaped capitulum. *Calomicrolaimus jenseni* sp. n. is characterised by an elongate cervical region, small (2 µm wide) amphids located at 44–54% of the pharyngeal length from the anterior and a conical tail with a pointed tip. *Ixonema deleyi* sp. n. is characterised by a small body (<400 µm long) an elongate cervical region, small (1–2 µm wide) circular amphids with rod-like corpus gelatum

located at 30–45% of the pharyngeal length from the anterior. *Microaimus texianus* Chitwood, 1951 is characterised by sexual dimorphism in the size of the amphids and presence of five pre-cloacal supplements. *Microaimus minutus* sp. n. is characterised by a small body (< 300 μ m long) that is often curved or coiled, amphids that are 55–60% cbd and located at 11–15 μ m away from the anterior end and short (12–15 μ m long) simple spicules. *Microaimus pwani* sp.n. is characterised by prominent cuticular annules, long cephalic sensilla, amphids that are 50–55% cbd and located at 11–13 μ m from the anterior end and long sausage-shaped striated sperms.

Notes: 6091

'File' Attachments: <internal-pdf://Muthumbi99-4049553408/Muthumbi99.pdf>

Language: English

Reference Type: Journal Article

Record Number: 93

Author: M. Raes, M. De Troch, S. G. M. Ndaro, A. Muthumbi, K. Guilini and A. Vanreusel

Year: 2007

Title: The structuring role of microhabitat type in coral degradation zones: a case study with marine nematodes from Kenya and Zanzibar

Journal: Coral Reefs

Volume: 26

Issue: 1

Pages: 113-126

Short Title: The structuring role of microhabitat type in coral degradation zones: a case study with marine nematodes from Kenya and Zanzibar

Legal Note: Kenya

Keywords: Coral degradation zones - Nematodes - Microhabitats - Spatial turnover - Indian Ocean

Abstract: Nematode genus assemblages were identified from four locations in coral degradation zones (CDZs) along the African east coast: Watamu and Tiwi Beach (Kenya) and Matemwe and Makunduchi (Zanzibar). Three microhabitat types were distinguished: coralline sediment, coral gravel and coral fragments. Nematode community composition was comparable to that of other studies dealing with the same habitat. The presence of a common genus pool in CDZs was reflected in the considerable similarities between samples. The addition of coral fragments as a habitat for nematodes resulted in an increased importance of taxa typical for coarse sediments and large substrata. Local and regional turnover were of the same order of magnitude. The structuring effect of microhabitat type clearly overrode the effect on a local and regional scale. Differences in sediment characteristics were more important in structuring the nematode assemblages than differences between the coralline sediment and coral fragments. No effect related to the three-dimensional structure of coral fragments was found. Differences between nematode assemblages in the coralline sediment and on coral fragments were attributed to the exposed nature of the latter habitat, its large surface area and its microbial or algal cover. Differences in available food sources were reflected in nematode trophic composition.

Notes: 6093

Language: English

Reference Type: Journal Article

Record Number: 94

Author: G. Pulitzer-Finali

Year: 1993

Title: A collection of marine sponges from East Africa

Journal: Annali del Museo civico di storia naturale Giacomo Doria

Volume: 89

Pages: 247-350

Short Title: Ann. Mus. Civ. Stor. Nat. "G. Doria"

Legal Note: Kenya

Keywords: Marine, sponges, Eastern Africa

Notes: 6094

Language: English

Reference Type: Journal Article

Record Number: 95

Author: J. R. Marsden

Year: 1975

Title: Classes of lipids in marine sponges from Kenya

Journal: Journal of the Experimental Marine Biology and Ecology

Volume: 19

Issue: 1

Pages: 9-18

Type of Article: Journal Article

Short Title: J. Exp. Mar. Biol. Ecol.

DOI: doi:10.1016/0022-0981(75)90033-7

Legal Note: Kenya

Keywords: Sponges, Lipids, Kenya

Abstract: The classes of lipid demonstrated in eight species of African sponges are described. Structural lipids are dominant while glycerides are common although variable in quantity. There are triglycerides, and glyceryl ether diesters. Steryl esters were found in all except one species. A wide variety of pigmented substances, up to ten in one species, is characteristic of most of the species studied.

Notes: 6095

'File' Attachments: internal-pdf://Madsen9_18-3799783168/Madsen9_18.pdf

Author Address: Department of Biology, McGill University, Montreal, P.Q., Canada

Language: English

Reference Type: Journal Article

Record Number: 96

Author: A. J. Kulmiye and K. M. Mavuti

Year: 2005

Title: Growth and Moulting Of Captive Panulirus Homarus Homarus In Kenya, Western Indian Ocean

Journal: New Zealand Journal of Marine and Freshwater Research

Volume: 39

Issue: 3

Pages: 539–549

Date: 2004

Type of Article: Journal Article

Short Title: Growth and Moulting Of Captive Panulirus Homarus Homarus In Kenya, Western Indian Ocean

DOI: DOI: 10.1080/00288330.2005.9517332

Legal Note: Kenya

Keywords: Growth

Moulting

Captive

Kenya

Abstract: Panulirus homarus homarus is the most widely distributed among the three P. homarus subspecies and is the second most important spiny lobster in the Kenyan lobster fishery after P. ornatus. Growth and moulting of lobsters, held in concrete tanks with a flow-through seawater supply and at ambient temperatures, were monitored for 18 months (October, 2001 - March, 2003). Both moult increment and moulting frequency were inversely correlated with size. Mean moult increment ranged from 4mm in the 36-45 mm CL size class to 0.6 mm in the 86-95 mm CL size class. Mean intermoult period increased from 49 days in the 46-55 mm CL size class to 81 days in the 86-95 mm CL size class. Growth rates were 19% and 46% higher for males and females, respectively during the southeast monsoon (low temperature) period than during the northeast monsoon (high temperature) season. A shift in energy use from growth to reproduction rather than the influence of temperature was responsible for the variation in the growth rates between the two seasons. Marking induced injuries caused a significant 65% growth reduction in the affected individuals. Mean moult increments calculated for most size classes of uninjured lobsters were comparable to those observed in lab reared subtropical P. homarus rubellus in South Africa but smaller than those reported in the Indian P. homarus under similar conditions. This indicates that growth in our experiment was slightly depressed probably in response to sub-optimal holding conditions.

Notes: 6096

'File' Attachments: internal-pdf://nzjmfr_2005_042[1]-0713323264/nzjmfr_2005_042[1].pdf

Author Address: Department of Zoology, University of Nairobi, Nairobi, Kenya

Language: English

Reference Type: Journal Article

Record Number: 97

Author: B. G. Ivanov and V. V. Krylov

Year: 1980

Title: Length-weight relationship in some common prawns and lobsters (macrura, natantia and reptantia) from the Western Indian Ocean.

Journal: Journal of Crustacean

Volume: 38

Issue: 3

Pages: 279-289

Short Title: Length-weight relationship in some common prawns and lobsters (*macrura*, *natantia* and *reptantia*) from the Western Indian Ocean.

Legal Note: Kenya

Keywords: Length-weight relationship, prawns and lobsters (*macrura*, *natantia* and *reptantia*), Western Indian Ocean

Abstract: Decapod crustaceans are of great importance for marine fisheries in the Indian Ocean waters (Longhurst, 1970). Due to their value, the crustaceans are extensively studied in many countries. Nevertheless, length-weight relationships have been established only for a few decapods inhabiting the western Indian Ocean. The present paper deals with the results of the biometrical analyses of common and abundant decapods from trawl catches of the "R/V Professor Mesyatsev."

Notes: 6097

'File' Attachments: internal-pdf://Crustaceana vol. 38 (3) Length Weight-0017219840/Crustaceana vol. 38 (3) Length Weight.pdf

Language: English

Reference Type: Journal Article

Record Number: 98

Author: W. Stephenson and M. Rees

Year: 1968

Title: Portunid crabs (Crustacea: Decapoda: Portunidae) collected by the 'Discovery' in the Indian Ocean.

Journal: J. Nat. Hist.

Volume: 1

Pages: 285-288

Short Title: Portunid crabs (Crustacea: Decapoda: Portunidae) collected by the 'Discovery' in the Indian Ocean.

Legal Note: Kenya

Keywords: *Charybdis smithii*, Portunid crabs, crustacean.

Abstract: On seven cruises with the R.V. Tyro, R.R.S. Discovery and R.V. Malcolm Baldrige in the NW Indian Ocean between 1992 and 1995, the pelagic swimming crab *Charybdis smithii* was found in great densities during July–August (SW monsoon) and January (NE monsoon). Discrete depth sampling, using RMT1 +8 and Mocness-10 gear, collected the species predominantly in the upper 200 m during night and day. Most of the crabs were concentrated above the thermo- and oxycline, both situated at around 150–200 m. In July–August the stock of crabs showed considerable variation, with maximum values of 1.9–2.4 crabs m⁻² (0–500 m, night) found in the Southern Somali Basin the Omani Basin and in the Central Arabian Sea. The maximum biomass (wet weight) of crabs was 12.7 g m⁻² (0–500 m, day) off Somalia and in the Central Arabian Sea during the SW monsoon. In January stocks and biomasses were lower, with maximum values of 0.1 and 2.0, off Somalia at 7°N. The size-frequency distribution of all crabs

found during the SW monsoon in the Somali Basin demonstrated the occurrence of smaller instars at the near-coast stations compared with the open ocean stations. During the NE monsoon there was a tendency for nearshore crabs to be larger than offshore. High concentrations of zoea and megalopa larvae of portunid crabs together with juvenile *C. smithii* were found in neuston samples off Somalia in May. Dense swarms of crabs occurred in the pelagic NW Indian Ocean in June–September (SW Monsoon). In October, crabs began to migrate onshore, where they characteristically formed surface swarms at night. Analysis of combined ship and literature data showed a 1 year life cycle for *C. smithii*. Aggregation of the crabs on the continental shelf precedes their breeding from about October to January (NE Monsoon). The larvae hatching in shelf waters disperse offshore and, after metamorphosis, form dense pelagic swarms from about July to August (SW monsoon).

Notes: 6098

Language: English

Reference Type: Journal Article

Record Number: 99

Author: M. H. Skov, RG Ruwa, RK Shunula, JP Vannini, M Cannicci, S

Year: 2005

Title: Marching to a different drummer: Crabs Synchronize Reproduction to a 14-Month Lunar-Tidal Cycle

Journal: Ecology

Volume: 86

Issue: 5

Pages: 1164–1171

Short Title: Marching to a different drummer: Crabs Synchronize Reproduction to a 14-Month Lunar-Tidal Cycle

Legal Note: Kenya

Keywords: Crabs; reproductive rhythm; reproductive synchrony; synodic cycle; tidal rhythm; tropics; Uca.

Abstract: Biological rhythms with lunar components are common in nature. In the sea, the moon's gravitational pull on earth is the principal cause of the tides, which normally reach maximum amplitudes every new and full moon. Many populations synchronize spawning to this time. Some choose either the new or the full moon, implying that moonlight is important; but one lunar phase usually has higher tides than the other, and many species select the phase with the higher tide to improve the offshore transport of their progeny. However, tidal dominance by one lunar phase is not constant; it switches between new and full moon every seven months. We tested the influence of this 14-month syzygy inequality cycle (SIC) on lunar synchrony by sampling 11 populations of intertidal crabs at two locations in East Africa for 21 months. Eight populations synchronized larval release with the SIC. Tidal cues were more important than moonlight in entraining the reproductive rhythm, although two populations synchronized spawning to the new moon. SIC synchrony increased with population shore level, because only the higher lunar tide permitted top-shore spawning. Top-shore species therefore have a restricted lunar choice. SIC synchrony could be common, given that it occurs in most marine environments.

Notes: 6099

'File' Attachments: internal-pdf://Skov-2919676160/Skov.pdf

Language: English

Reference Type: Journal Article

Record Number: 100

Author: D. P. Gillikin, B. De Wachter and J. F. Tacks

Year: 2004

Title: Physiological responses of two ecologically important Kenyan mangrove crabs exposed to altered salinity regimes.

Journal: Journal of Experimental Marine Biology and Ecology

Volume: 301

Issue: 1

Pages: 93-109

Type of Article: Journal Article

Short Title: Physiological responses of two ecologically important Kenyan mangrove crabs exposed to altered salinity regimes.

Legal Note: Kenya

Keywords: Invertebrata

Arthropoda

Crustacea

Decapoda

Environmental factor

Brackish water environment

Brachyura

Marine environment

Salinity

Mangrove

Abstract: The potential long-term effects of altered salinity regimes on the bioenergetics of two ecologically important Kenyan mangrove crabs, *Neosarmatium meinerti* de Man, 1887 and *Neosarmatium smithi* H. Milne Edwards, 1853 were investigated in light of recent findings suggesting that groundwater redirection may alter salinity regimes in Kenyan mangroves. Although changes in groundwater may cause only small increases in salinities, these changes would be chronic and may impact crab populations already living above their optimal salinity. To assess potential impacts, fundamental physiological processes and hemolymph components were measured on animals acclimated to 16‰, 32‰, 48‰ and 65‰ for 4 weeks in a field laboratory. For comparative purposes, crabs were also sampled in the field. *N. smithi* survived poorly in all salinities except the control (32‰). Although high mortality in *N. smithi* did not allow for reliable estimations of an energy budget, mortality and osmoregulatory capacity shows that this species can osmoregulate for a limited time in elevated salinities (± 1 week), but cannot withstand long-term hypersaline conditions. In contrast, *N. meinerti* survived well and was able to osmoregulate for 1 month in all salinity treatments. Nevertheless, their energy budget, was significantly reduced (to below 0) in the 65‰ treatment. Overall, this study shows that these two congeneric species exhibit different long-term responses to variations in salinity.

However, they are both negatively effected by hypersaline conditions, suggesting that long-term alteration of mangrove salinity regimes may be detrimental for these ecologically important mangrove crab populations.

Notes: 6100

'File' Attachments: <internal-pdf://Gillikin-3810257664/Gillikin.pdf>

Author Address: Unit of Ecology and Systematics, Department of Biology, Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussels, Belgique

Language: English

Reference Type: Journal Article

Record Number: 101

Author: D. P. Gillikin and C. D. Schubart

Year: 2004

Title: Ecology and systematics of mangrove crabs of the genus *Perisesarma* (Crustacea: Brachyura: Sesarmidae) from East Africa.

Journal: Zoological Journal of the Linnean Society London

Volume: 141

Pages: 435-445.

Start Page: Zool. J. Linn. Soc. Lond

Date: 2004

Type of Article: Journal Article

Short Title: Ecology and systematics of mangrove crabs of the genus *Perisesarma* (Crustacea: Brachyura: Sesarmidae) from East Africa.

Legal Note: Kenya

Keywords: Ecology, systematics, crabs, perisesarma

Notes: 6101

'File' Attachments: <internal-pdf://Gillikin2-1243263488/Gillikin2.pdf>

Language: English

Reference Type: Journal Article

Record Number: 102

Author: A. Flores, J. Paula and T. Dray

Year: 2003

Title: First zoeal stages of grapsid crabs (Crustacea: Brachyura) from the East African coast.

Journal: Zoological Journal of the Linnean Society

Volume: 137

Pages: 355-383

Start Page: Zool. J. Linnean Soc.

Date: 2003

Type of Article: Journal Article

Short Title: First zoeal stages of grapsid crabs (Crustacea: Brachyura) from the East African coast.

Legal Note: Kenya

Keywords: First zoeal stages, grapsidoiea, mangrove, Indo-pacific.

Abstract: In this study, the larvae of 14 grapsoid species from the East African coast are examined. Original descriptions of the first zoeal stage are provided for the grapsids *Grapsus fourmanoiri*, *G. tenuicrustatus*, *Pachygrapsus minutus* and *P. plicatus*, and the sesarmids *Sarmatium crassum* and *Sesarma leptosoma*. The first zoea of *Ilyograpsus paludicola* is illustrated for the first time. Redescriptions are presented for the grapsid *Metopograpsus messor* and the gecarcinid *Cardisoma carnifex*, while the appendage setation of the varunid *Helice leachii*, and the sesarmids *Chiromantes eulimene*, *Neosarmatium meinerti*, *Parasesarma catenata* and *Perisesarma guttatum* are also given and compared with previous work. The first zoeal stages of all these species can be identified, either by comparing their overall morphology or their appendage setation. The validity of combining setation features of the maxilla and maxillipeds to separate grapsoid families is further supported, but special attention is called to the sesarmid *Sesarma leptosoma*, which presents an unexpected setal arrangement on the basis of the first maxilliped. A more troublesome situation is that of the grapsid *Ilyograpsus paludicola*. The present descriptions provide evidence of a surprising combination of characters, suggesting that this species should be removed from the Grapsoidea as already indicated by other authors.

Notes: 6102

'File' Attachments: <internal-pdf://Flores-2316933888/Flores.pdf>

Language: English

Reference Type: Journal Article

Record Number: 103

Author: M. W. R. G. H. Skov

Year: 2004

Title: Paradoxical selective feeding on a low-nutrient diet: why do mangrove crabs eat leaves?

Journal: *Oecologia*

Volume: 131

Issue: 1

Pages: 1-7.

Type of Article: Journal Article

Short Title: Paradoxical selective feeding on a low-nutrient diet: why do mangrove crabs eat leaves?

ISSN: 0029-8549

Legal Note: Kenya

Keywords: Invertebrata ; Arthropoda ; Crustacea ; Decapoda ; Brachyura ; Hardwood forest tree ; Spermatophyta ; Angiospermae ; Dicotyledones ; Verbenaceae ; Feeding ; Trophic factor ; Environmental factor ; Brackish water environment ; Africa ; Tanzania ; *Avicennia marina* ; Zanzibar ; Mangrove ; Vegetal tannin ; Carbon nitrogen ratio ; Plant leaf ; Sediments ; Nutritive value ; Diet ; Burrow ; Feeding behavior ; Foraging behavior ;

Abstract: Sesarmid crabs dominate Indo West-Pacific mangroves, and consume large amounts of mangrove litter. This is surprising, since mangrove leaves have high tannin contents and C/N ratios that far exceed 17, normally taken as the maximum for sustainable animal nutrition. This paradox has led to the hitherto untested hypothesis that crabs let leaves age in burrows before consumption, thereby reducing tannin content and C/N ratio. We excavated burrows of

Neosarmatium meinerti within high-shore Avicennia marina mangroves, and investigated whether burrow leaves had C, N or C/N values significantly different from those of senescent leaves. Leaves were found in <45% of burrows, mostly only as small fragments, and N concentrations and C/N ratios of burrow leaves never varied significantly from senescent leaves. The leaf-ageing hypothesis was therefore not supported. In the field N. meinerti and Sesarma guttatum fed on sediment in 76% and 66-69% of observations, respectively, and on leaves in <10% of observations. Sediments from two A. marina mangroves had a mean C/N ratio of 19.6. Our results, and the literature, show that mangrove leaves are unlikely to fulfil the N requirements of crabs, whether or not leaf ageing takes place. Sediment detritus could be a richer source of N, as shown by lower C/N ratios and regular ingestion by crabs. By fragmenting leaves crabs may be elevating the nutritional quality of the substrate detritus.

Notes: 6103

'File' Attachments:

internal-pdf://Skov_&_Hartnoll_2002_Paradoxical_selective_feeding_on_low_nutrient[1]-3659129088/Skov_&_Hartnoll_2002_Paradoxical_selective_feeding_on_low_nutrient[1].pdf

Author Address: University of Liverpool, Port Erin Marine Laboratory, Isle of Man IM9 6JA, ROYAUME-UNI

Language: English

Reference Type: Thesis

Record Number: 104

Author: M. Skov

Year: 2003

Title: Reproduction and feeding ecology of East African mangrove crabs, and their influence on forest energy flow

University: University of Liverpool Library

Degree: PhD

Thesis Type: PhD thesis

Short Title: Reproduction and feeding ecology of East African mangrove crabs, and their influence on forest energy flow

Keywords: Reproduction, feeding, ecology, mangrove, crabs, forest energy flow

Notes: 6104

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 105

Author: F. Dahdouh-Guebas, M. Verneirt, S. Cannicci, J. G. Kairo, T. J.F. and N. Koedam

Year: 2004

Title: The influence of abiotic and biotic factors on the distribution of mangrove crabs at Mida Creek (Kenya): Crab zonation.

Journal: Journal of wetland ecology and management

Short Title: The influence of abiotic and biotic factors on the distribution of mangrove crabs at Mida Creek (Kenya): Crab zonation.

Legal Note: Kenya

Keywords: Crab, Detrended, Correspondence Analysis, Grapsidae, Kenya, mangrove, zonation.

Abstract: Despite earlier efforts to understand the role played by grapsid crabs in mangroves, their importance in the structuring and functioning of such systems is fully appreciated, particularly with regard to small-scale studies. The present study provides some new data on the interaction between mangroves and crabs, namely the link between the distribution of particular mangrove tree species and the distribution of certain crab species at the assemblage level. Floristic and faunistic relevés were made in Gazi Bay (2 sites) and Mida Creek (3 sites), 140 km apart on the Kenyan coast, along five transects in a series of quadrats covering the width of the mangrove belts. Zonation of both mangrove vegetation and brachyuran fauna was described and height above datum and distance to the mainland (limit of non-flooded area) measured. The relationship between the presence and the absence of crabs and trees was analysed using detrended correspondence analysis. Summarized, the mangrove tree zonation pattern contains four assemblages with a particular dominant species: first a landward *Avicennia marina* zone, followed by a mixed zone with *Cerriops tagal*, *Rhizophora mucronata* and *Bruguiera gymnorrhiza*, and finally a *R. mucronata* zone and a *Sonneratia alba* zone, both of which can mix with seaward *A. marina*. Ordination results show that the distribution of *Neosarmatium meinerti* and *Sesarma ortmanni* is linked to the landward *A. marina* zone, that of *Neosarmatium smithii*, *Sesarma guttatum* and *Sesarma leptosoma* corresponds to the *R. mucronata* zone and that of *Metopograpsus thukuhar* and *Sesarma elongatum* to the seaward *A. marina* and *S. alba* zone. There appears to be one major underlying factor in the zonation of both crabs and trees, with most likely a complex multiple causality. In certain cases the association between crabs and trees are causal, whereas in other cases it can be the result of an independent restriction to the same zones by a common cause.

Notes: 6105

Language: English

Reference Type: Journal Article

Record Number: 106

Author: F. J. Slim, M. A. Hemminga, C. J. Ochieng, N.T., E. Cocheret de la Moriniere and G. Van der Velde

Year: 1997

Title: Leaf litter removal by the snail *Terebralia palustris* (Linnaeus) and sesarmid crabs in an East African mangrove forest (Gazi Bay, Kenya)

Journal: Journal of Experimental Marine Biology and Ecology

Volume: 215

Pages: 35-48

Short Title: Leaf litter removal by the snail *Terebralia palustris* (Linnaeus) and sesarmid crabs in an East African mangrove forest (Gazi Bay, Kenya)

Legal Note: Kenya

Keywords: Brackish water environment ; Gastropoda ; Mollusca ; Invertebrata ; Brachyura ; Decapoda ; Crustacea ; Arthropoda

Abstract: Quantitative data on leaf litter removal activity of macrozoobenthic organisms in the mangrove forests of East Africa are virtually non-existent. In the present study, litter removal

activity was determined in two contrasting types of mangrove stands in Gazi Bay (Kenya). In the relatively elevated *Cerriops tagal* vegetation, which is only flooded during spring tides, the detritivorous snail *Terebralia palustris* (Linnaeus) was the major macrobenthic organism responsible for litter removal. Analysis of the $\delta^{13}\text{C}$ value of the foot tissue of the snail indicated a segregation in the food consumed by individuals below and above a size of 50 mm, in agreement with the observation that only larger individuals were feeding on the leaf litter. In the low lying *Rhizophora mucronata* stand, which is flooded by each high tide, the crab *Sesarma guttatum* (H. Milne Edwards) was responsible for most of the litter removal (consumption and burial). The availability of water in the *C. tagal* stand, caused by tidal inundation or by rainfall, was a determining factor in the amount of litter being removed. When the stand remained dry around neap tides, the median litter removal, as a percentage of the litter fall, was only 0.8%. Under wet conditions around spring tide this percentage was much higher: 41.6% by night and 25.2% by day, respectively. These figures reflect the behaviour of *T. palustris*, which is inactive under dry conditions in order to avoid desiccation. Median litter removal in the *R. mucronata* vegetation, expressed as a percentage of the litter fall, was 40.3% by day and 21.7% by night. No relation was observed between lunar cycle and activity of the litter processing crabs. Taking into consideration differences in inundation frequency and duration, and in litter removal activity by benthic animals as related to tidal height and day/night cycles, we estimate that in this East African mangrove, on average, 11.2% and 18.6% of the fallen litter is processed by macrobenthic animals in the *C. tagal* and in the *R. mucronata* vegetation, respectively. Our results indicate that removal of fallen leaf litter in mangrove forests is not effected by benthic communities dominated by crabs only, but that activities of litter feeding snails may also be significant.

Notes: 6106

'File' Attachments: internal-pdf://Slim-3856678656/Slim.pdf

Language: English

Reference Type: Thesis

Record Number: 107

Author: D. A. Sigana

Title: The reproductive biology of *Thalamita crenata* (Latreille) at Gazi Bay in Kenya

University: University of Nairobi Library

Degree: Msc.

Thesis Type: Msc. Thesis

Short Title: The reproductive biology of *Thalamita crenata* (Latreille) at Gazi Bay in Kenya

Keywords: Brachyuran crab, *Thalamita crenata*, Developmental stages, Gazi bay.

Abstract: The brachyuran crab *Thalamita crenata* (Latreille) occurring intertidally along the Kenyan coast was sampled at Gazi over a period of 12 months. The crabs were collected using scoopnets over a distance covering two kilometres along the bay. The carapace was opened up and the state of the ovaries examined during the entire study period. The developmental stages of embryos in females which had extruded their embryos were identified. The minimum size at sexual maturity was related to the state of ovaries. The fecundity of the crabs was obtained by counting the number, weighing the embryo mass and estimating their sizes. Regression analysis was used to estimate the linear relationship between fecundity and carapace width, embryo

mass weight and embryo size respectively. A positive relationship was found between fecundity and carapace width, showing that fecundity increases with carapace width ($t=9.908$; $df=205$; $p<0.001$) and between fecundity and embryo mass weight, showing that fecundity increases with embryo mass weight ($t=9.55$; $df=205$; $p<0.001$) while no significant relationship was found between fecundity and embryo size ($t=1.04$; $df=205$; $p>0.05$).

Notes: 6107

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 108

Author: F. Gherardi and M. Vannini

Year: 1993

Title: Hermit crabs in a mangrove swamp: proximate and ultimate factors in the clustering of *Clibanarius laevimanus*

Journal: Journal of the Experimental Marine Biology and Ecology

Volume: 168

Pages: 167-187

Start Page: J. Exp. Mar. Biol. Ecol.

Date: 1993

Type of Article: Journal Article

Short Title: Hermit crabs in a mangrove swamp: proximate and ultimate factors in the clustering of *Clibanarius laevimanus*

Legal Note: Kenya

Keywords: Spatial orientation

Homing

Aggregation

Gregarious behavior

Strategy

Shelter

Abstract: The proximate and ultimate factors of the clustering behavior in the mangal-dwelling hermit *Clibanarius laevimanus* have been studied at Mida Creek, Kenya. First, field experiments showed that the hermits correctly oriented towards their clustering sites after deprivation of references from the sky, landscape, and substrate. Second, the pros and cons are weighed of various hypotheses on the adaptive significance of clustering; the most plausible is that aggregations may serve as «shell exchange markets». Although shell exchange is rare, most hermits in the group could benefit from such a chain process, and the adaptive significance of clustering could be magnified.

Notes: 6108

'File' Attachments: internal-pdf://Gherardi_et_al[1]-0319026944/Gherardi_et_al[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 109

Author: M. Vannini, G. Innocenti and R. K. Ruwa

Year: 1995

Title: Family group structure in mysids, commensals of hermit crabs (Crustacea).

Journal: Tropical zoology

Volume: 6

Issue: 1

Pages: 189-205.

Short Title: Family group structure in mysids, commensals of hermit crabs (Crustacea).

Legal Note: Kenya

Keywords: Animal active movement ; Vertical migration ; Environmental factor ; Light ; Luminous intensity ; Climbing behavior ; Marine environment ; Decapoda ; Crustacea ; Arthropoda ; Invertebrata.

Abstract: *Sesarma leptosoma* is a mangrove crab that lives among the mangrove roots and migrates twice a day to the canopy to feed on leaves and leaf-buds. An experiment was performed by covering the whole root system of mangrove trees with white and black tents, thus differentially reducing the light intensity reaching the crabs, in order to investigate whether the light level could be responsible for the onset of the morning upward migration. A correlation was found between the light reduction induced by the tents of different colours and the delay in the crab migration departure. Reaction to a light threshold is an efficient mechanism to synchronise perfectly the activity of a whole crab population. The questions under discussion are why the migration should start in such a synchronised and explosive way and, more generally, why these intertidal crabs should regulate their migratory activity with the light level instead of the level of the tide.

Notes: 6109

'File' Attachments: <internal-pdf://vannini-3898408961/vannini.pdf>

Language: English

Reference Type: Journal Article

Record Number: 110

Author: P. J. Reay and J. Haig

Year: 1990

Title: Coastal hermit crabs (Decapoda: Anomura) from Kenya, with a review and key to East African species.

Journal: Bulletin of Marine Science

Volume: 46

Issue: 3

Pages: 578-589

Short Title: Coastal hermit crabs (Decapoda: Anomura) from Kenya, with a review and key to East African species.

Legal Note: Kenya

Keywords: Hermit crabs, Habitat, Occurrence, Kenya.

Abstract: A collection of hermit crabs from supralittoral, intertidal and shallow sublittoral areas of the Kenya coast between latitudes 3°50'S and 4°30'S, revealed the occurrence of 24 species belonging to the genera *Coenobita*, *Diogenes*, *Dardanus*, *Calcinus*, *Clibanarius*, *Trizopagurus* and

Paguristes. One of the Calcinus species is undescribed, three of the other species constitute new records for the East African mainland, and all but one are strictly new records for Kenya whose hermit crab fauna has received no attention in the literature. The species are discussed in terms of habitat and their occurrence at the five main collecting sites; the occurrence and distribution of 52 coastal hermit crab species from the whole of East Africa and adjacent islands is also reviewed, and a key for identifying the mainland species is presented.

Notes: 6110

'File' Attachments: internal-pdf://Reay et al-1919603201/Reay et al.pdf

Language: English

Reference Type: Report

Record Number: 111

Author: N. a. J. Radull and edited by Muthiga, H.

Year: 2009

Title: Distribution and abundance of penaeid shrimps in Fundisa Bay, Kenya, during the north East monsoon season.

Institution: African Studies Centre

Publisher: A. S. Centre

Short Title: Distribution and abundance of penaeid shrimps in Fundisa Bay, Kenya, during the north East monsoon season.

Keywords: Distribution, Abundance, penaeid shrimps, Fundisa Bay, Kenya

Abstract: This is a mention on the distribution and abundance of penaeid shrimps in Fundisa Bay, Kenya, during the north east monsoon winds in a report in the Advances in Coastal Ecology as pertains the environmental stressors that adversely affect the ecosystem hence impacting on their occurrence.

Notes: 6111

Last Modified Date: Emmanuel Mbar

Language: English

Reference Type: Journal Article

Record Number: 112

Author: C. P. M. Khamala

Year: 2004

Title: Ecology of Echinometra mathaei (Echinoidea: Echinodermata) at Diani Beach, Kenya

Journal: Marine Biology

Volume: 11

Issue: 2

Pages: 167-172

Short Title: Ecology of Echinometra mathaei (Echinoidea: Echinodermata) at Diani Beach, Kenya

Legal Note: Kenya

Keywords: Diani Beach, Kenya coast, distribution, density, behaviour, Echinometra mathaei

Abstract: Studies were carried out on the inner and outer coral reefs at Diani Beach on the Kenya coast to assess the distribution, density and behaviour of Echinometra mathaei (de Blainville). Transects 1 m wide were run on the two reefs in April, June and September, 1970.

Test measurements on representative samples from the animal populations on both reefs were also taken. Direct observations on specimens of *E. mathaci* in selected rock pools on the outer reef were made to determine their movement, gregariousness, homing and feeding behaviour. Population density was higher on the inner reef furthest from the sea at low tide than on the outer reef. On the submerged inner coral reef at low tide, *E. mathaei* occurred mainly exposed on the seaweeds, but, on the exposed outer reef, its main niches were crevices in rock pools and under coral ledges. Size-frequency distributions revealed that smaller individuals occurred on the inner reef and larger ones on the outer reef. The growth rate of *E. mathaei* was estimated from the positions of modal values, calculated from size-frequency distributions. No gregarious or homing behaviour was observed and, once settled in a suitable crevice, *E. mathaei* showed little movement.

Notes: 6112

'File' Attachments: internal-pdf://Khamala[1]-2201882368/Khamala[1].pdf

Language: English

Reference Type: Conference Paper

Record Number: 113

Author: Y. Samyn and E. Vanden Berghe

Year: 2000

Title: Faunistics as an impetus for conservation of sea cucumbers (Echinodermata: Holothuroidea) in the littoral waters of Kenya.

Conference Name: ICES 2000 Annual Science Conference, Brugge

Conference Location: Brugge.

Pub Place: Kenya

Keywords: Echinodermata: Holothuroidea, littoral waters, Kenya.

Abstract: Aspidichorotid sea cucumbers (Echinodermata: Holothuroidea) are heavily fished in the littoral waters of Kenya, which results in plummeting stocks. In order to conserve and manage these natural resources appropriate conservation and management plans have to be developed. This can only be done if high quality research on different levels broadens our understanding of the stocks in question. This poster discusses the importance of faunistics (based on correct nomenclature, taxonomy & systematics) in the fine tuning of conservation efforts.

Notes: 6113

'File' Attachments: internal-pdf://Mini1400-3231692033/Mini1400.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book

Record Number: 114

Author: D. G. Reid

Year: 1986

Title: The littorinid molluscs of mangrove forests in the Indo-Pacific region, genus *littoraria*.

Publisher: British Museum (Natural History)

Short Title: The littorinid molluscs of mangrove forests in the Indo-Pacific region, genus

littoraria.

Keywords: Littorinid molluscs, mangrove forests, Indo-Pacific region, genus littoraria.

Notes: 6114

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 115

Author: W. B. Mutagyera

Year: 1978

Title: Some observations on the Kenya Lobster Fishery.

Journal: East African Agricultural Forestry Journal

Volume: 43

Issue: 4

Pages: 401-409

Short Title: Some observations on the Kenya Lobster Fishery.

Legal Note: Kenya

Keywords: Prawns (Penacidae), spiny lobsters (palinuridae), shrimps (caridae) and crabs (portunidae), overfishing.

Abstract: For many years crustacea have been exploited along Kenya's coast. The most important crustacea here are prawns (Penacidae) and the spiny lobsters (palinuridae). Some shrimps (caridae) and crabs (portunidae) are landed but these are much less important. Spiny lobsters have been exploited since about 1954 and the fishing pressure gradually increased with growing demand for food in restaurants and hotels. It was considered necessary to investigate the possible occurrence of overfishing and to advice on its avoidance. I therefore decided to examine the catch landed by the commercial fishermen right at the landing sites. The main fishing groups for lobsters are the coral reefs. Some lobsters are also caught among seaweeds and rocks: piles near sand banks. In this discussion I consider this overfishing and suggest a lower -size limit that I hope would allow females to reproduce before being caught.

Notes: 6115

'File' Attachments: internal-pdf://Mutagyera[1]-1297704449/Mutagyera[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 116

Author: W. B. Mutagyera

Year: 1982

Title: Notes on the deep water spiny lobster, Puerulus angulatus in the Kenyan water

Journal: East African Agricultural and Forestry

Volume: 45

Issue: 1

Pages: 18-21

Short Title: Notes on the deep water spiny lobster, Puerulus angulatus in the Kenyan water

Legal Note: Kenya

Keywords: Puerulus angulatus, Kenyan waters, trawls.

Abstract: Spiny lobster fishing along the Kenya Coast has been practiced for many years; The commercial catches consist of Panulirus species landed by small scale divers. These are shallow water operations. Deep-Water spiny lobsters have not been exploited although occasional catches by trawlers suggest the existence of this resource in some abundance. Catch rates of over 60 'kg/hr was realized. The catch rate exceeded 400 kg/hr on one occasion. Successful hauls were made mainly in April, July and November using high opening fish and shrimp trawls. Occurrence of berried females in the catch suggested that breeding of this species takes place in July/August, the period of South-East Monsoons.

Notes: 6116

'File' Attachments: internal-pdf://Mutegera2[1]-3411673601/Mutegera2[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 117

Author: G. F. Losse

Year: 1997

Title: Notes on the portunid crab *Charybdis edwardsi* (Leene & Buitendijk, 1949), from the Western Indian Ocean.

Journal: Journal of the Natural History

Volume: 3

Pages: 145-152

Start Page: J. Nat. Hist.

Short Title: Notes on the portunid crab *Charybdis edwardsi* (Leene & Buitendijk, 1949), from the Western Indian Ocean.

Legal Note: Kenya

Keywords: Reproductive biology, Crabs, *Charybdis smithii*.

Abstract: Tardigrades from the littoral zone were collected. One marine species *Batillipes phreaticus* Renaud-Debyser was recorded and two species in the immediate supralittoral zone. The external morphology of *B. phreaticus* is examined with the scanning electron microscope.

Notes: 6117

Language: English

Reference Type: Thesis

Record Number: 118

Author: P. Mjomba

Year: 2005

Title: Crab species dynamics in replanted mangroves.

City: Nairobi

University: Jomo Kenyatta University of Agriculture and Technology

Degree: MSc

Thesis Type: MSc Thesis

Short Title: Crab species dynamics in replanted mangroves.

Keywords: Crabs, Species dynamics, Replanted, mangroves.

Notes: 6118

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 119

Author: J. Paula, R. N. Mendes, J. Mwaluma, C. Raedig and W. Emerson

Year: 2003

Title: Combined Effects of Temperature and Salinity on Larval Development of the Mangrove Crab *Parasesarma catenata* Ortman, 1897 (Brachyura: Sesarmidae).

Journal: Western Indian Ocean Journal of Marine Science

Volume: 1

Issue: 2

Pages: 57-63

Short Title: Combined Effects of Temperature and Salinity on Larval Development of the Mangrove Crab *Parasesarma catenata* Ortman, 1897 (Brachyura: Sesarmidae).

Legal Note: Kenya

Keywords: larval development, temperature, salinity, Brachyura, mangroves

Abstract: The larval stages of the mangrove crab *Parasesarma catenata* were reared in the laboratory from eggs of females collected in the Mgazana estuary, South Africa. Survival and duration of larval stages were tested for the combined effects of temperature and salinity in a factorial design experiment, using three females each with two replicates of 15 larvae per combination. Combinations were made from five temperature (15, 20, 25, 30 and 35 °C) and four salinity values (15, 25, 35 and 45 ‰). Results were tested by ANOVA and multiple regression was applied to generate contour models by polynomial equation. It was found that *P. catenata* larvae develop optimally in near to seawater salinity at a temperature of around 25 °C. These results support the assumption that newly-hatched larvae of this species are exported from the estuarine environment to the sea for development.

Notes: 6119

'File' Attachments: <internal-pdf://28429-33123-1-PB-0609808896/28429-33123-1-PB.pdf>

Language: English

Reference Type: Thesis

Record Number: 121

Author: D. B. Anyona

Year: 1999

Title: Crab predation on the oyster *Saccostrea cucullata* (von Born, 1778): chemical effects of prey densities and chemical metabolites.

City: Brussels

University: Vrije Universiteit Brussel

Degree: Msc

Thesis Type: Msc. thesis

Short Title: Crab predation on the oyster *Saccostrea cucullata* (von Born, 1778): chemical

effects of prey densities and chemical metabolites.

Keywords: Crabs, Predation, Oyster, chemical effects.

Notes: 6121

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 122

Author: S. Cannicci, D. Anyona, F. Dahdouh-Guebas and M. Vannini

Year: 1994

Title: Homing in the mangrove swimming crab *Thalanita crenata* (Decapoda, Portunidea).

Journal: Boll. Zool. Suppl.

Volume: 92

Pages: 242-252.

Date: 1995

Type of Article: Journal Article

Short Title: Homing in the mangrove swimming crab *Thalanita crenata* (Decapoda, Portunidea).

Legal Note: Kenya

Keywords: Homing ; Visual cue ; Cartography ; Animal active movement ; Home range ; Field study ; Marine environment ; Mangrove ; Indian Ocean ; Kenya ; Africa ; Spatial orientation ; Portunidae ; Brachyura ; Decapoda ; Crustacea ; Arthropoda ; Invertebrata

Abstract: On the Kenyan coast, *Thalamita crenata* confines itself to a defined system of crevices and forages, swimming in a few cm of water, within a radius of about 5 m from its shelter. A field study was designed to analyse this crab's ability to find its shelter after being moved away from it. Crabs were displaced, being kept under water, with full vision of the sky and landscape and released 5 m away from their refuges, at a maximum depth of 50 cm. They were able to return to their shelters within 1 h and followed initial directions which were well orientated towards home. *T. crenata* was still well orientated and successful in returning home during nocturnal displacements and even after trials in which the landscape was altered. Only blind crabs were neither initially orientated towards home nor successful in returning within two tidal cycles of their release. The hypothesis that this swimming crab could use orientating information obtained during the outward displacement was then tested. Specimens were dislocated following a non-linear outward path, without vision of the surrounding landscape; other crabs were carried to a false release point and then carried in a closed container to the actual release point. Finally, three kinds of detour experiments were performed. In all these trials the directions chosen by the crabs were still clustered around the home direction and homing success was again high. These results exclude homing mechanisms based on random search strategies or on egocentric mechanisms, such as path integration. The most probable hypothesis is that *T. crenata* organizes some visual cues in a map-like arrangement and, detecting these cues from any release point within its home range, uses this map to return home.

Notes: 6122

'File' Attachments: <internal-pdf://908281888-1562280448/908281888.pdf>

Language: English

Reference Type: Journal Article

Record Number: 123

Author: R. G. Hartnoll, S. Cannici, W. D. Emmerson, S. Fratini, A. Macia, Y. Mgaya, F. Porri, R. K. Ruwa, J. P. Shunula, M. W. Skov and M. Vannini

Year: 2004

Title: Geographical trends in mangrove crab abundance in East Africa.

Journal: Journal of wetland ecology and management

Volume: 10

Issue: 3

Pages: 203-213

Short Title: Geographical trends in mangrove crab abundance in East Africa.

Legal Note: Kenya

Keywords: Crab abundance - crab biomass - East Africa - geographic trends – mangroves.

Abstract: The aim of this work was to determine the abundance of crabs in mangrove communities along a latitudinal gradient along the eastern coast of Africa from 4°S to 32°S. Surveys were made at Mombasa (Kenya), Zanzibar (Tanzania), Maputo (Mozambique) and in the Transkei (South Africa). Crabs were estimated at three designated levels in the mangroves by visual census using a common protocol, and numbers were converted to biomass. Even after standardising the selection of sites and methods of census there was still extensive variability in the data, emphasising the complex heterogeneity of mangrove ecosystems. Lunar phase (full versus new moon springs) did not have a consistent effect on results, but shore height had several effects. Total crab biomass was similar in the two lower shore strata examined, but about twice as high at the top-Avicennia level. The ratio of grapsid biomass: ocy podid biomass also changed with height: from near unity in the lower mangrove, to 0.14 in the middle strata, but to 15 at the top. There was no consistent latitudinal trend in total crab numbers, but total crab biomass increased from north to south. In addition there was a consistent and marked change in the grapsid biomass: ocy podid biomass ratio: this swung from 0.65 at Mombasa to 6.8 in the Transkei. This has implications for the transfer of primary production through the food chain. Grapsids are important macrophagous feeders on the leaves and other parts of mangroves, whereas ocy podids are microphagous deposit feeders.

Notes: 6123

'File' Attachments: internal-pdf://Hartnoll-3392760320/Hartnoll.pdf

Language: English

Reference Type: Conference Paper

Record Number: 125

Author: N. Amiyo, S. Visram, M. Omar and D. Obura

Year: 2007

Title: Incidence of the crown-of-thorns starfish, *Acanthaster planci*, on coral reefs in Kenya: Implications of biodiversity conservation in peri-urban marine protected areas: The case of Mombasa marine park.

Conference Name: 5th Western Indian Ocean Marine Science Association Scientific Symposium proceedings.

Publisher: WIOMSA

Pub Place: Kenya

Keywords: Biodiversity; Coastal zone management; Coral reefs; Ecosystem management; Marine parks; Predators;

Abstract: The global threat to ecosystems as a result of climate change due to human activities has generated much debate of late. There is particularly a great uncertainty for peri-urban ecosystems where the rate of population growth and industrial development is seemingly high. Observations made from ecological monitoring of coral reef ecosystems in protected areas in Kenya, revealed that the abundance of crown-of-thorns starfish (COTs), *Acanthaster planci*, was higher in peri-urban Mombasa Marine National Park and Reserve (MMNP/R). Adult *A. planci* are voracious predators of live hard corals and may cause significant damage to coral reefs at high abundances. From August 2004 to January 2005, densities varied between 26 and 40 individuals ha⁻¹, and was close to the threshold of a population outbreak. This increased threefold between January and June 2005, to more than 100 individuals ha⁻¹, prompting *A. planci* removals from the reef as a mitigation. The densities of *A. planci* declined significantly on both study reefs after the first removal session, in June 2005, from a mean of 105 to 15 individuals ha⁻¹ in the park, and from 80 individuals ha⁻¹ to 15 individuals ha⁻¹ in the reserve. Data from an independent study, documenting natural levels of *A. planci* predation on permanently marked corals was assessed in relation to the removals. This data is identified as potentially valuable for management since changes in the frequency of predation on corals by *A. planci* serve as an indicator of the effectiveness of the removal programme. This clearly reveals the need for a proactive management regime as opposed to a reactive management regime. This can be achieved through an effective Integrated Coastal Zone Management framework and potentially help in building and safeguarding resilience in frequently stressed urban ecosystems.

Notes: 6125

'File' Attachments: internal-pdf://amiyo WIOMSA-2468973830/amiyo WIOMSA.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 126

Author: J. K. Okechi and J. J. Polovina

Year: 1995

Title: An evaluation of artificial shelters in the artisanal spiny lobster fishery in Gazi Bay, Kenya

Journal: South African Journal of Marine Science

Volume: Vol. 16

Pages: 373-376.

Short Title: An evaluation of artificial shelters in the artisanal spiny lobster fishery in Gazi Bay, Kenya

Legal Note: Kenya

Keywords: Artificial shelters, artisanal spiny-lobster, fishery, Gazi Bay, Kenya

Abstract: Two designs of artificial shelters were evaluated for use in the artisanal spiny-lobster fishery in Gazi Bay, Kenya. Both types of shelter were effective in aggregating the spiny lobster

Panulirus ornatus in nearshore seagrass beds. Lobsters aggregated at the shelters were caught by free-diving fishermen, using spearguns and hand nets. Mean lobster catches taken from the shelters ranged from 0,38 to 0,83 kg' trip⁻¹, around 50% of those taken farther offshore in natural reefs. No significant difference was found in the size or sex composition between shelter and reef-caught lobsters.

Notes: 6126

'File' Attachments: internal-pdf://Okechi 1995[1]-4208640000/Okechi 1995[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 127

Author: M. Carreiro-Silva and T. R. McClanahan

Year: 2001

Title: Echinoid bioerosion and herbivory on Kenyan coral reefs: the role of protection from fishing.

Journal: Journal of the Experimental Marine Biology and Ecology

Volume: 262

Issue: 2

Pages: 133-153

Type of Article: Journal Article

Short Title: Echinoid bioerosion and herbivory on Kenyan coral reefs: the role of protection from fishing.

Legal Note: Kenya

Keywords: Bioerosion; Coral reef; Diadema; Echinothrix; Echinometra; Grazing; Herbivory; Sea urchins

Abstract: During feeding, echinoids remove a large proportion of calcium carbonate in addition to the algae growing on dead coral and are consequently of importance in estimating the turnover of organic and inorganic carbon in coral reefs. Rates of herbivory and the erosion of dead coral substratum, referred to as bioerosion, by the most abundant echinoid species in Kenyan reefs, *Echinothrix diadema* (Linnaeus), *Diadema setosum* (Leske), *D. savignyi* (Michelin) and *Echinometra mathaei* (de Blainville), were compared in three different reef categories with different histories of fishing and its exclusion. These were reefs: (i) protected within Marine National Parks, which exclude all forms of fishing, coral and shell collection for more than 25 years; (ii) one reef within a Marine Park, which has received protection from fishing activities for 8 years (referred to as 'newly protected' reef); and (iii) unprotected reefs, which experience heavy fishing and some coral collection. The aim was to investigate the grazing and bioerosion activity by the above echinoid species in these reef categories. We surveyed sea urchin population densities and determined their rates of bioerosion and herbivory per individual and square meter. Individual rates of bioerosion and herbivory, of the species *D. setosum*, *D. savignyi* and *E. diadema* were estimated from laboratory gut content analysis and gut evacuation experiments in the field, using elevated underwater cages. Individual rates of bioerosion and herbivory of *E. mathaei* were obtained from a previous field study [J. Exp. Mar. Biol. Ecol. 147 (1991) 121]. Sea urchin bioerosion was greater than herbivory for all studied species and proportional to the body size of the sea urchin species. The large-bodied *E.*

diadema exhibited the highest bioerosion and herbivory rates (5.5 ± 0.9 and 2.2 ± 0.3 g individual⁻¹ day⁻¹, respectively) followed by *D. setosum* (1.8 ± 0.3 and 1.1 ± 0.2 g individual⁻¹ day⁻¹) and *D. savignyi* (0.7 ± 0.2 and 0.4 ± 0.1 g individual⁻¹ day⁻¹). Highest sea urchin densities were recorded at unprotected reefs (6.2 ± 1.5 individual m⁻²), and therefore, bioerosion and herbivory by sea urchins were also highest in this reef category (1180 ± 230 g CaCO₃ m⁻² year⁻¹ and 450 ± 77 g algae m⁻² year⁻¹). Protected reefs recorded 20 times lower sea urchin bioerosion and herbivory rates (50.3 ± 25.8 g CaCO₃ m⁻² year⁻¹ and 20.7 ± 10.4 g algae m⁻² year⁻¹), due to the low sea urchin population densities in these reefs (0.06 ± 0.01 individual m⁻²). The newly protected reef, with intermediate number of sea urchins (1.2 ± 0.1 individual m⁻²), had intermediate rates of sea urchin bioerosion and herbivory (711 ± 157 g CaCO₃ m⁻² year⁻¹ and 299 ± 63 g algae m⁻² year⁻¹). These findings suggest that echinoids are important in the carbon cycle and reef development, and that fishing can influence these ecological processes.

Notes: 6127

'File' Attachments: <internal-pdf://Carreiro-Silva01-0320739073/Carreiro-Silva01.pdf>

Language: English

Reference Type: Journal Article

Record Number: 128

Author: R. K. Ruwa

Year: 1990

Title: Growth of *Crassostrea cucullata* Born (Bivalvia) at different levels in the intertidal zone.

Journal: Aquaculture

Volume: 88

Pages: 303-312

Short Title: Growth of *Crassostrea cucullata* Born (Bivalvia) at different levels in the intertidal zone.

Legal Note: Kenya

Keywords: *Crassostrea cucullata*, intertidal zone, empirical equations.

Abstract: The growth patterns of *Crassostrea cucullata* born at different levels in the intertidal zone were studied using empirical equations based on size at age data in the exponential growth phase which occurred in the first 10 months after the spat settled. The growth rate was related to height of shore level and decreased in an upward direction. The faster growth occurred below mean tide level. Oysters translocated from higher levels to lower levels showed an increase in growth rate. Conversely, those translocated from lower levels to higher levels showed reduction in growth rate.

Notes: 6128

'File' Attachments: [internal-pdf://Ruwa_1990\[1\]\[2\]-2573442816/Ruwa_1990\[1\]\[2\].pdf](internal-pdf://Ruwa_1990[1][2]-2573442816/Ruwa_1990[1][2].pdf)

Language: English

Reference Type: Journal Article

Record Number: 129

Author: E. N. Kimani, K. M. Mavuti, T. K. Mukiyama and N. Wambiji

Year: 2008

Title: Macrofauna Settlement on Pearl Oyster Collectors in Kenya: Seasonality and Abundance.

Journal: Western Indian Ocean Journal of Marine Science

Volume: 7

Issue: 1

Pages: 81-94

Date: 2008

Type of Article: Journal Article

Short Title: Western Indian Ocean J. Mar. Sci.

Legal Note: Kenya

Keywords: Pearl oysters

seed collection

macrofauna

bivalves

settlement

monsoon seasons

Kenya

Abstract: Collection of pearl oyster seed from the wild using artificial collectors is a critical step in the production of cultured pearls. This paper reports the seasonal abundance of macrofauna, which settled on spat collectors set to collect *Pinctada margaritifera* and *Pteria penguin* seed in shallow inshore areas at Kisite and Mombasa, Kenya. In both, settlement of macrofauna and bivalves was higher during the northeast monsoon season than the southeast monsoon season. Ascidiarians and Sabellidae were significantly more abundant on collectors during the southeast monsoon season. A few bivalve species of commercial value including: *P. penguin*, *Perna viridis* and *Anadara antiquata* also settled on collectors during the southeast monsoon. Multivariate analysis showed the periods April-June and June-October presented significantly different macrofaunal assemblages in the open lagoon environment at Mombasa, whereas a significant difference occurred between assemblages settled during June-October and October-January in the channel environment in Tudor. Seven *P. penguin* specimens were obtained from 41 spat collectors in Kisite, whereas one *P. margaritifera* and three *P. penguin* specimens were obtained from 40 spat collectors deployed in Tudor Channel during the southeast monsoon period. From the results, settlement of *P. margaritifera* appears to be episodic and needs long term monitoring to determine the environmental and oceanographic conditions that are associated with its recruitment.

Notes: 6129

'File' Attachments: <internal-pdf://48256-62008-1-PB-2696090368/48256-62008-1-PB.pdf>

Language: English

Reference Type: Journal Article

Record Number: 130

Author: E. N. Okemwa, R. K. Ruwa and P. Polk

Year: 1986

Title: The autoecology of the edible oyster *Crassostrea cucullata* Born 1778: Size related vertical distribution at Mkomani, Mombasa.

Journal: Kenya Journal of Science

Volume: 7

Issue: 2

Pages: 9-14

Short Title: The autoecology of the edible oyster *Crassostrea cucullata* Born 1778: Size related vertical distribution at Mkomani, Mombasa.

Legal Note: Kenya

Keywords: *Crassostrea cucullata*, size-related, distribution.

Abstract: The littoral oyster *Crassostrea cucullata* occurs between 1.05-3.35 m above chart datum with the highest density occurring between 1.85-2.75m. Its distribution is size-related as demonstrated by computation of correlation coefficients (r) and regression equations. The shell lengths (i.e.~ maximum linear. dimension) decreases in an up-shore direction. The analysis show high r -values which are significant at $p < 0.001$. The equations and the r values are as follows: 1. for the lower level oysters between 1-1.85m: $y = 43.64 - 6.49 x$, $r = .0.659$; 2. for the mid-level oysters between 1.86-2.75 m: $y = 62.67 - 17.14 x$, $r = -0.941$; and 3. for the high level oysters between 2.763.35 m: $y = 91.44 - 24.85 x$, $r = -0.899$; where y stands for the mean shell length (mm) and x is the mean height (m) above datum. The elevation and density related effects on the shell lengths of the oysters are discussed.

Notes: 6130

'File' Attachments:

internal-pdf://KJS02508257-7N2P914B-3562830080/KJS02508257-7N2P914B.pdf

Language: English

Reference Type: Journal Article

Record Number: 131

Author: S. Cannicci, R. K. Ruwa, M. Giuggioli and M. Vannini

Year: 1998

Title: Predatory activity and spatial strategies of *Epixanthus dentatus* (Decapoda: Oziidae), an ambush predator among the mangroves.

Journal: Journal of Crustacean Biology

Volume: 18

Issue: 1

Pages: 57-63

Type of Article: Journal Article

Short Title: Predatory activity and spatial strategies of *Epixanthus dentatus* (Decapoda: Oziidae), an ambush predator among the mangroves.

Legal Note: Kenya

Keywords: *Epixanthus dentatus*, mangroves, Creek, Kenyan coast.

Abstract: The predatory patterns and spatial strategies of *Epixanthus dentatus* were studied in a mangrove creek on the Kenyan coast, together with laboratory analysis aimed at assessing the natural diet. This xanthoid fed on almost all the slowly moving invertebrates common in the forest and actively preyed at night, using an ambush technique. *Epixanthus dentatus* is faithful to individual dens among the roots and to well-defined feeding areas within a 3-m radius, which they shared with an average of 2 other individuals. The high density of *E. dentatus* seemed to affect the behavior of major prey species; various grapsid crab species reduced their climbing

activity during the peak activity periods of *E. dentatus*. The density of *E. dentatus* among the mangrove roots was determined both by the number of suitable dens, and, more directly, by the density of prey species.

Notes: 6131

'File' Attachments: internal-pdf://cannicci-1499180545/cannicci.pdf

Language: English

Reference Type: Journal Article

Record Number: 132

Author: R. K. Ruwa and P. Polk

Year: 1994

Title: Patterns of spat settlement of the tropical oyster *Crassostrea cucullata* (Born 1778) and the barnacle, *Balanus amphitrite* Darwin (1854) in mangrove creek.

Journal: Tropical Zoology

Volume: 7

Issue: 1

Pages: 121-130

Short Title: Patterns of spat settlement of the tropical oyster *Crassostrea cucullata* (Born 1778) and the barnacle, *Balanus amphitrite* Darwin (1854) in mangrove creek.

Legal Note: Kenya

Keywords: *Crassostrea cucullata*, *Balanus amphitrite*, Mangrove creek.

Notes: 6132

'File' Attachments: internal-pdf://Ruwa et al-0577472001/Ruwa et al.pdf

Language: English

Reference Type: Journal Article

Record Number: 134

Author: S. O. Omollo

Year: 1987

Title: A study of total protein, fat and ash contents of sea urchins: *Diadema setosum* (Leske) *Stomopneustes variolaris* (Lamarck) and *Echinometra mathaei* (De blainville).

Journal: East Afr. Agric. For. J.

Volume: 53

Issue: 1-2

Pages: 65-70.

Short Title: A study of total protein, fat and ash contents of sea urchins: *Diadema setosum* (Leske) *Stomopneustes variolaris* (Lamarck) and *Echinometra mathaei* (De blainville).

Legal Note: Kenya

Keywords: Protein, fat, ash, sea urchins: *Diadema setosum*, *Stomopneustes variolaris*, *Echinometra mathaei*

Notes: 6134

'File' Attachments: internal-pdf://Omollo-2725858048/Omollo.pdf

Language: English

Reference Type: Journal Article

Record Number: 133

Author: R. K. Ruwa and V. Jaccarini

Year: 1988

Title: Nocturnal feeding migrations of *Nerita plicata*, *N. undata* and *N. textilis* (Prosobranchia: Neritacea) on the rocky shores at Mkomani, Mombasa, Kenya

Journal: Marine Biology

Volume: 99

Issue: 2

Pages: 229-234

Short Title: Nocturnal feeding migrations of *Nerita plicata*, *N. undata* and *N. textilis* (Prosobranchia: Neritacea) on the rocky shores at Mkomani, Mombasa, Kenya

Legal Note: Kenya

Keywords: *Nerita plicata*, *N. undata* and *N. textilis* (Prosobranchia: Neritacea), rocky shores, Mkomani, Mombasa, Kenya.

Notes: 6134

'File' Attachments: internal-pdf://Ruwa88-2178831360/Ruwa88.pdf

Language: English

Reference Type: Journal Article

Record Number: 135

Author: P. M. Oduor-Odote, M. H. Struszczyk and M. G. Peter

Year: 2005

Title: Physicochemical properties of Chitosan in Some Crustacean species from Kenya and in Blowfly larvae

Journal: Western Indian Ocean Journal of Marine Sciences

Volume: 4

Issue: 1

Pages: 99-107

Date: 2005

Type of Article: Journal Article

Short Title: Western Indian Ocean J. Mar. Sci.

ISSN: 0856-860X

Legal Note: Kenya

Keywords: Physicochemical

Chitosan

Crustacean

Kenya

Blowfly larvae

Abstract: Isolation of chitosan from cuticles of blue bottlefly larvae *Calliphora erythrocephala*, and shells of crab *Sylla cerrata*, lobster *Panulirus ornatus*, prawn *Paeneaus indicus* was carried out. The yield of chitin was 12.0%, 23.0%, 15.7% and 28.0% respectively. In the same order the yield of chitosan was 66.0%, 74.6% 74.3% and 75.0% from chitin. Ash in the crab and lobster chitosan demineralised with 0.5M HCl was 30.2 and 22.4% respectively. This was reduced to

0.2 % for lobster and 0.4% for crab using 2M HCl for demineralisation and 0.5M HCL was adequate for demineralisation of prawns to bring the ash content to < 1%. The ash content in the blowfly larvae was negligible. The conditions used for chitosan isolation in blowfly larvae were milder requiring no demineralisation step. The time to obtain soluble chitosan in 1% v/v acetic acid was 8 hr for crab and lobster at 100°C deacetylation and 4 hr at 120°C while for prawns it was 6 hr at 100°C and 3 hr at 120°C deacetylation temperature. The average molecular weight (̂MV) for crabs was 556,000 after 8 hr deacetylation and 148,000 at 140°C deacetylation temperature. With 2M HCl used for demineralisation first, it was 439,000 for a 4 hr period. Crabs, first demineralised then deprotenised the ̂MV was 155,000 for a 3 hr deacetylation at 120°C and 417,000 for 1 hr deacetylation. An 8 hr deacetylation at 100°C for lobsters gave ̂MV of 791,000. It was reduced to 560,000 after 4 hr of deacetylation at 120°C and to 236,000 at 140°C for 3 hr. Prawns had a ̂MV of 507,000 after 6 hr deacetylation at 100°C and reduced to 455,000 after a 3 hr deacetylation. For insect larvae, at 100°C deacetylation for 4 hr the ̂MV was 413,500 while for 1 hr, 2 hr and 2.5 hr deacetylation time at 120°C it was 369,000, 308,500 and 263,000 respectively. The degree of deacetylation (DD) increased with temperature and time of deacetylation. For crab, demineralised then deprotenised, it increased from 72.9% in 1 hr then 81.5% in 3 hr. In prawn chitosan it was 60.0% for the 6 hr deacetylation at 100°C and 69.2% for 3 hr deacetylation at 120°C. The DD of insect larvae was 62.56% after 4 hr of deacetylation at 100°C. When deacetylated at 120°C it was 64.0% after 1 hr, 79.9% after 2 hr and 80.7% after 2.5 hr. The moisture content showed a slight increase with DD. Temperature increase and time of deacetylation caused a decrease in MV and a more conservative increase in DD.

Notes: 6135

URL: ajol.info/index.php/wiojms/article/view/28478/5158

'File' Attachments: [internal-pdf://28478-16204-1-PB-4237368320/28478-16204-1-PB.pdf](#)

Author Address: Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya

Reference Type: Journal Article

Record Number: 136

Author: J. S. Eklo, M. de la Torre-Castro, M. Gullstro, U. J., N. Muthiga, T. Lyimo and S. O. Bandeira

Year: 2008

Title: Sea urchin overgrazing of sea grasses: A review of current knowledge on causes, consequences, and management.

Journal: Estuarine, Coastal and Shelf Science

Volume: 79

Issue: 4

Pages: 569–580

Date: 2008

Type of Article: Journal Article

Short Title: Sea urchin overgrazing of sea grasses: A review of current knowledge on causes, consequences, and management.

Legal Note: Kenya

Keywords: seagrass herbivory; overgrazing; management; urchin; top-down; bottom-up; side-in

Abstract: Sea urchins are one of the most common seagrass macro-grazers in contemporary seagrass systems. Occasionally their grazing rates exceed seagrass growth rates, a phenomenon sometimes referred to as overgrazing. Because of a reported increasing frequency of overgrazing events, concomitant with loss of seagrass-associated ecosystem services, it has been suggested that overgrazing is one of the key threats to tropical and subtropical seagrasses. In light of this, we review the current knowledge on causes, consequences, and management of sea urchin overgrazing of seagrasses. Initially we argue that the definition of overgrazing must include scale and impairment of ecosystem services, since this is the de facto definition used in the literature, and will highlight the potential societal costs of seagrass overgrazing. A review of 16 identified cases suggests that urchin overgrazing is a global phenomenon, ranging from temperate to tropical coastal waters and involving at least 11 seagrass and 7 urchin species. Even though most overgrazing events seem to affect areas of <0.5 km², and recovery often occurs within a few years, overgrazing can have a range of large, long-term indirect effects such as loss of associated fauna and decreased sediment stabilization. A range of drivers behind overgrazing have been suggested, including bottom-up (nutrient enrichment), top-down (reduced predation control due to e.g. overfishing), “side-in” mechanisms (e.g. changes in water temperature) and natural population fluctuations. Based on recent studies, there seems to be fairly strong support for the top-down and bottom-up hypotheses. However, many potential drivers often co-occur and interact, especially in areas with high anthropogenic pressure, suggesting that multiple disturbances—by simultaneously reducing predation control, increasing urchin recruitment and reducing the resistance of seagrasses—could pave the way for overgrazing. In management, the most common response to overgrazing has been to remove urchins, but limited knowledge of direct and indirect effects makes it difficult to assess the applicability and sustainability of this method. Based on the wide knowledge gaps, which severely limits management, we suggest that future research should focus on (1) identification and quantification of ecosystem and societal scale effects of overgrazing; (2) assessment of the relative importance and interactions of different drivers; and (3) development of a holistic proactive and reactive long-term management agenda.

Notes: 6136

'File' Attachments: <internal-pdf://Eklof01-2452174081/Eklof01.pdf>

Author Address: Department of Systems Ecology, Stockholm University, S-106 91 Stockholm, Sweden

Language: English

Reference Type: Journal Article

Record Number: 137

Author: M. Vannini, E. Mrabu, S. Cannicci, R. Rorandelli and S. Fratini

Year: 2008

Title: Rhythmic vertical migration of the gastropod *Cerithidea decollate* in a Kenyan mangrove forest.

Journal: Journal of Marine Biology

Volume: 153

Pages: 1047–1053

Date: 2008

Type of Article: Journal Article

Short Title: Rhythmic vertical migration of the gastropod *Cerithidea decollate* in a Kenyan mangrove forest.

Legal Note: Kenya

Keywords: Rhythmic, migration, *Cerithidea decollate*, mangrove forest, Kenya

Notes: 6137

'File' Attachments: internal-pdf://Vannini et al 2008-1105273600/Vannini et al 2008.pdf

Language: English

Reference Type: Report

Record Number: 138

Author: E. O. Wakwabi

Year: 1996

Title: Recruitment of the Giant (Jumbo) Tiger Prawn *Penaeus monodon* in the Backwaters of Tundo, Mombasa, Kenya.

Series Title: WIOMSA MARG Reports

Institution: WIOMSA

Pages: 03. 35pp.

Publisher: WIOMSA

Short Title: Recruitment of the Giant (Jumbo) Tiger Prawn *Penaeus monodon* in the Backwaters of Tundo, Mombasa, Kenya.

Keywords: Recruitment, *Penaeus monodon*, Backwaters, Tundo, Mombasa, Kenya

Notes: 6138

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 139

Author: E. N. Fondo

Year: 2007

Title: The effects of mangrove deforestation on mangrove mud crab fishery.

Publisher: WIOMSA

Short Title: The effects of mangrove deforestation on mangrove mud crab fishery.

Report Number: WIOMSA-MARG I. No. 2007-5.

Keywords: Mangroves

Scylla serrata

Ngomeni

crab

reproductive stages

Abstract: Mangrove forests support diverse animal populations of commercial importance among them mangrove is the mud crab *Scylla serrata*. Destruction of mangroves through deforestation, conversion into salt pans and for aquaculture has been a major concern and is

likely to affect the systems the mangrove support, including crab fishery. Mud crab catches from areas with different levels of mangrove destruction in Ngomeni area, Malindi Kenya were analysed. The population structure and maturity stages of crabs from the Malindi crab market were also examined. Interviews with crab fishers and crab dealers were conducted to get information on crab fishery and environmental changes in the area. Results show that the mangroves of Ngomeni area have been overexploited and there is a decline in the crab catches from Ngomeni area and generally, young immature crabs are exploited with male crabs dominating. The monthly size frequency distribution showed growth in the crab population. The crab fishery and marketing in the area is highly dependent on tourist seasons. For purposes of management of the resource mangrove reforestation and regulation of crab sizes caught is recommended. More monitoring work is also required.

Notes: 6139

'File' Attachments:

internal-pdf://Esther%2520N%2520Fondo%2520MARG%25201-07-2425600256/Esther%2520N%2520Fondo%2520MARG%25201-07.pdf

Author Address: Kenya Marine and Fisheries Research Institute

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 140

Author: J. Mwaluma

Year: 2003

Title: Culture experiment on the growth and production of mud crabs, mullets, milkfish and prawns in Mtwapa mangrove system, Kenya.

Short Title: Culture experiment on the growth and production of mud crabs, mullets, milkfish and prawns in Mtwapa mangrove system, Kenya.

Report Number: WIOMSA-MARG 1:2002-2003

Keywords: Culture, growth, production, mud crabs, mullets, milkfish, prawns, Mtwapa, mangrove system, Kenya.

Abstract: Experimental culture of crabs, fish and prawns was conducted in a pond measuring approximately 800 m² in Kwetu training center, Mtwapa, Kenya. The objective was to evaluate the success, potential and economic viability of the culture system. Crabs were placed in 6 experimental cages measuring 2 x 2 x 0.5m for 3 months in different stocking densities in order to compare their survival. The three densities were 3.0, 6.0 and 9.0 crabs/m². Other crabs were placed in compartments made of locally available 'fito' designed in eight compartments measuring 1x1 x 0.9 ft for crab fattening. In the same pond, 2045 juvenile prawns *Penaeus monodon* and *P. indicus* measuring between 21-25 mm in total length were stocked inside the pond to grow, together with milkfish and mullets. At the end of 3 months, harvesting was done for crabs, and after 6 months for prawns and fish. Environmental variables were measured in the pond biweekly during the six month period. This included temperature, salinity, chlorophyll a, nitrates, phosphates and pH. Higher survival of crabs occurred in the cages that had a stocking density of 3.0 crabs/m². For crab fattening, highest mean growth per month was 24.6 gm, while lowest was 6.7 gm. A mortality of 43% was experienced during crab fattening at the

end of the culture period. Recapture of prawns was poor due to inability to drain the pond completely, and mortality, however a number of fish by catch are reported. Constraints and recommendations are discussed.

Notes: 6140

URL: www.oceandocs.org/bitstream/.../WIOMSAMARG-I200306Mwaluma.pdf

'File' Attachments:

internal-pdf://WIOMSAMARG-I200306Mwaluma[1]-0037246465/WIOMSAMARG-I200306Mwaluma[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 142

Author: T. R. McClanahan

Year: 1989

Title: Kenyan coral reef associated gastropod fauna: a comparison between protected and unprotected reefs

Journal: Marine Ecology Progress Series

Volume: 53

Pages: 11-20

Short Title: Kenyan coral reef associated gastropod fauna: a comparison between protected and unprotected reefs

Legal Note: Kenya

Keywords: Gastropod fauna, protected, unprotected, reefs, Kenya.

Abstract: Comparative survey of prosobranch gastropods was undertaken within 3 marine parks and 3 unprotected reefs to compare fauna differences attributable to management and non-management policies. The total gastropod fauna was typified by low densities and high diversity and variability in species composition. Protected reefs had a higher diversity for combined reef locations and higher species richness on reef edges and lagoons but not reef flats. Differences in reef edges are attributable to physical differences in reef aspect and wave energy but lagoon differences are attributable to human influences. Total gastropod densities were similar for comparisons between reef flat and edges but unprotected reef lagoons had higher ($p < 0.001$) densities than protected lagoons. Overall, most commercially collected species were not significantly denser in protected sites than unprotected sites. Some species such as *Lambis truncata* and *L. chiragra* were clearly more dense within protected sites, which may be attributable to shell collection in unprotected reefs. Many important commercial species including *Charonia tntonis*, *Cassis cornuta*, *Turbo rnarrotus*, *Chicoreus rarnosus* and *Cypraecassi rufa* were found at very low densities regardless of location and may naturally occur at such low densities. An experimental study of predation on the gastropod *Morula granulata* suggested that predation is low but may affect gastropod distribution patterns as the total gastropod density was well predicted ($r = -0.96$, $p < 0.01$) by predation rates on *M. granulata*. Unprotected reef lagoons had lower predation rates ($p < 0.06$) than protected lagoons. Reduced predation rates and increased densities may be caused by finfish reductions due to human fishing activities. Shell collecting appears to be affecting a few but not most

populations. Less direct changes in the gastropod fauna appear to be caused by overfishing of finfish and a reduction in their predators.

Notes: 6142

'File' Attachments: internal-pdf://McClanahan_11-20-4195657984/McClanahan_11-20.pdf

Language: English

Reference Type: Journal Article

Record Number: 143

Author: T. R. McClanahan

Year: 1990

Title: Kenyan coral reef-associated gastropod assemblages: distribution and diversity patterns

Short Title: Kenyan coral reef-associated gastropod assemblages: distribution and diversity patterns

Legal Note: Kenya

Keywords: Gastropod assemblages, distribution, diversity, coral reef, Kenya

Abstract: A survey of Kenya's shallow water (<2 m) coral reef-associated prosobranch fauna was undertaken to determine patterns of distribution, density, diversity and species richness, and the possible role of other reef fauna and human utilization on these patterns. The sample assemblage of 135 species from 25 families is similar to other Indian Ocean regions with no apparent endemism or sub-regional faunal affinities. Species richness, determined by species-individual relationships, has been reduced by approximately 45% since the Pleistocene. Northern Kenya, typified by small coral islands experiencing river and estuarine discharges had low densities and species richness and high species variability. This is attributable to the interrelated factors of river discharge, small reefs and reduced predator refuge. Southern Kenya's more expansive fringing reef has a denser and richer fauna but appears less species rich than Tanzania. Variation within reefs suggests similarities in diversity between reef lagoons, flats and edges, but lagoons had lower densities than reef flat or edge sites. This is attributable to greater predation rates within lagoons. Species composition between reef locations was variable but differed for comparisons between reef lagoons and reef flats. The population densities of thirty commercially collected species were compared between shelled and unshelled reefs. Only two commercial strombids, *Lambis truncata* and *L. chiragra*, had lower densities within shelled compared to unshelled reefs. Within six southern Kenyan reef lagoons, total gastropod densities were negatively correlated with the Balistidae (triggerfish) and total fish densities and positively with sea urchin densities. The removal of balistids through fishing appears to lead to co-occurring population increases in gastropod and sea urchin populations which, in most instances, appears to negate the effect of shell collecting.

Notes: 6143

'File' Attachments: <internal-pdf://McClanahan1-2533738496/McClanahan1.pdf>

Language: English

Reference Type: Journal Article

Record Number: 144

Author: T. R. McClanahan

Year: 1997

Title: Dynamics of *Drupella cornus* populations on Kenyan coral reefs

Journal: Coral Reef Sym

Volume: 1

Pages: 633-688

Short Title: Dynamics of *Drupella cornus* populations on Kenyan coral reefs

Legal Note: Kenya

Keywords: Dynamics, *Drupella cornus*, coral reefs, Kenya

Abstract: In the central Pacific and western Australia the coral-eating snail *Drupella cornus* has been reported to exhibit large population increases or outbreaks (>10 snails/m²) that result in the loss or devastation of their coral prey. In Kenya, a large population increase of *Drupella cornus* was recorded from the early 1990's where *D. cornus* increased from a rare species in the mid 1980's to among the most common prosobranch snail by 1995 (~0.2 snails/m²). Population increases were most commonly observed in a section of reef that had experienced heavy fishing and loss of the durophagous predators such as triggerfish, but still maintained a high abundance of the branching coral *Porites nigrescens*. In unfished reefs, the population increases of *D. cornus* were less pronounced despite an abundance of their preferred coral prey - branching *Acropora*, *Montipora*, and *Pocillopora*. In one heavily fish reef, with a high abundance of another coral-eating snail, *Coralliophila neritoidea*, and low abundance of branching corals, few *D. cornus* were observed. Consequently, the success of *D. cornus* appears to be related to a complex interaction between appropriate environmental conditions for settlement success, the existence of branching corals, a low abundance of predators and the lack of other competitors such as *C. neritoidea*. An alternate hypothesis is that *D. cornus* settlement is patchy in space and time and the patterns observed in Kenya simply reflect this patchiness.

Notes: 6144

'File' Attachments:

internal-pdf://mcclanahan_t_r_drup[1]-4178214913/mcclanahan_t_r_drup[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 145

Author: T. R. McClanahan and J. C. Mutere

Year: 1994

Title: Coral and sea urchin assemblage structure and interrelationships in Kenyan reef lagoons

Journal: Hydrobiologia

Type of Article: Journal Article

Short Title: Coral and sea urchin assemblage structure and interrelationships in Kenyan reef lagoons

ISSN: 0018-8158.

Legal Note: Kenya

Keywords: Coral reefs

community structure

diversity

human impacts

marine parks
species richness

Abstract: Patterns of hard coral and sea urchin assemblage structure (species richness, diversity, and abundance) were studied in Kenyan coral reef lagoons which experienced different types of human resource use. Two protected reefs (Malindi and Watamu Marine National Parks) were protected from fishing and coral collection, but exposed to heavy tourist use. One reef (Mombasa MNP) received protection from fishermen for one year and was exploited for fish and corals prior to protection and was defined as a 'transitional reef. Three reefs (Vipingo, Kanamai, and Diani) were unprotected and experienced heavy fishing and some coral collection. Protected and unprotected reefs were distinct in terms of their assemblage structure with the transitional reef grouping with unprotected reefs based on relative and absolute abundance of coral genera. Protected reefs had slightly higher ($p < 0.01$) coral cover ($23.6 \pm 8.3\% \pm S.D.$) than unprotected reefs (16.7 ± 8.5), but the transitional reef had the highest coral cover (30.8 ± 6.4) which increased by 250% since measured in 1987: largely attributable to a large increase in *Porites nigrescens* cover. Protected reefs had higher coral species richness and diversity and a greater relative abundance of *Acropora*, *Montipora* and *Galaxea* than unprotected reefs. The transitional reef had high species richness, but lower diversity due to the high dominance of *Porites*. Sea urchins showed the opposite pattern with highest diversity in most unprotected reefs. Coral cover, species richness, and diversity were negatively associated with sea urchin abundance, but the relative abundance of *Porites* increased with sea urchin abundance to the point where *Porites* composed > 90% of the coral cover at sites with the highest sea urchin abundance. Effects of coral overcollection was only likely for the genus *Acropora* (staghorn corals). A combination of direct and indirect effects of human resource use may reduce diversity, species richness, and abundance of corals while increasing the absolute abundance of sea urchins and the relative cover of *Porites*.

Notes: 6145

'File' Attachments: <internal-pdf://McClanahan286-0420685312/McClanahan286.pdf>

Language: English

Reference Type: Journal Article

Record Number: 146

Author: N. A. Muthiga

Year: 2003

Title: Coexistence and reproductive isolation of the sympatric echinoids *Diadema savignyi* Michelin and *Diadema setosum* (Leske) on Kenyan coral reefs

Journal: Marine Biology

Volume: 143

Pages: 669-677

Date: 2003

Type of Article: Journal Article

Short Title: Coexistence and reproductive isolation of the sympatric echinoids *Diadema savignyi* Michelin and *Diadema setosum* (Leske) on Kenyan coral reefs

Legal Note: Kenya

Keywords: Coexistence, reproductive isolation, *Diadema savignyi*, *Diadema setosum*, Kenyan.

Abstract: The sympatric echinoids *Diadema savignyi* and *D. setosum* coexist in shallow reef lagoons throughout East Africa. The reproductive strategies of these echinoids were studied to investigate reproductive isolation as a possible mechanism for maintaining the coexistence of these closely related species. The annual reproductive cycle and lunar periodicity were determined by gonad index measurements, histological examination of gametogenesis, and induction of spawning with injections of KCl. The peak reproductive period of *D. savignyi* coincided with the north-east monsoon period (when light and temperatures are high) as gonad indices were high (>8%) beginning in February and peaked at 9.7% in May. Gonad indices subsequently rapidly decreased (by 26%) in June at the beginning of the cooler southeast monsoon period. However, the presence of sperm and ova in most months of the year indicates continuous gametogenesis with reduced reproductive effort during the cooler months. The annual cycle for *D. setosum* showed less of a seasonal trend as gonad indices remained above 7% throughout much of the year but tended to be highest when temperatures were lower. This is the first confirmation of continuous reproduction in these two species at the equator. The reproductive patterns of both species remained consistent over 2 years of sampling. Both species exhibited a synchronized lunar spawning periodicity during the 3 months sampled, with *D. setosum* spawning on lunar days 8–10 and *D. savignyi* spawning after the full moon (lunar days 17–18). Whereas spawning in *D. savignyi* was very tightly synchronized, 20% of *D. setosum* individuals still spawned after the peak spawning period. The coexistence of these closely related species appears to be maintained by temporal reproductive isolation during the lunar spawning period reinforced by seasonal differences in reproductive effort.

Notes: 6146

'File' Attachments: internal-pdf://Muthiga[1]-2302331392/Muthiga[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 147

Author: N. A. Muthiga

Year: 2003

Title: The reproductive biology of a new species of sea cucumber, *Holothuria arenacava* in a Kenyan Marine protected area: the possible role of light and temperature on gametogenesis and spawning.

Journal: Marine Biology

Volume: 143

Issue: 4

Pages: 669-677

Short Title: The reproductive biology of a new species of sea cucumber, *Holothuria arenacava* in a Kenyan Marine protected area: the possible role of light and temperature on gametogenesis and spawning.

Legal Note: Kenya

Keywords: *Holothuria arenacava*, reproductive biology, light, temperature, gametogenesis,

spawning.

Abstract: The sea cucumber *Holothuria arenacava* was discovered in the Mombasa marine reserve in 1997 and described by Samyn et al. (2001). The reproductive biology of this holothurian was investigated in order to (1) characterize the reproductive pattern, (2) examine the relationship among environmental parameters including temperature, light and lunar period, and (3) examine the relationship between the reproductive pattern and feeding of this new species. The gonad index method and microscopic examination of gonads was used to analyze samples collected for a period of 13 months. *H. arenacava* displayed an annual reproductive cycle with gametogenesis commencing in July during the south-east monsoons, when temperature and light intensity are lowest along the Kenyan coast. Gonad growth peaked in February–March at the end of the north-east monsoons when temperatures and light reach their annual maxima along the Kenyan coast. The higher correlation between light intensity and gonad growth ($r=0.93$) than temperature ($r=0.71$), coupled with the fact that temperatures continued to drop for a month after gametogenesis had already commenced, suggests that light intensity and not temperature is the cue for the onset of gametogenesis in this species. Spawning was synchronized between females and males and occurred during a short period between March and May (inter-monsoonal period) when both temperature and light intensity decrease along the Kenyan coast. Male and female gonad indices showed significant variation with lunar day and no lunar periodicity was observed in this sea cucumber. The sex ratio of the population of *H. arenacava* was skewed towards significantly more females than males, and females were significantly larger and had larger gonads and gonad indices than males. These life history strategies including spawning during a short discrete period, more and larger females that have larger gonads (i.e., typically more fecund), and spawning just prior to the peak in phytoplankton concentrations, a time that is probably more favorable for larval development, may serve to increase the reproductive success of this sea cucumber.

Notes: 6147

Language: English

Reference Type: Government Document

Record Number: 148

Author: E. Fondo

Year: 2008

Title: Cephalopod in South Coast, Kenya.

Department: Fisheries

City: Mombasa

Publisher: Kenya Marine and Fisheries Research Institute

Government Body: Kenya

Congress Number: Invertebrates

Keywords: Cephalopod, Squids, Octopus, Vanga, Shimoni.

Abstract: There has been increasing attention on 'non-conventional' marine resources which include cephalopods. In Kenya Cephalopod fishery has not been studied and the south coast of Kenya is one of the areas where Cephalopod fishery is active. Information on cephalopod fishery from Vanga and Shimoni was collected and analyzed. There has been a general increase in Octopus and squid landings over the years. Cephalopod landings follow a seasonal pattern,

with high landings being reported during the North east monsoon period. The CPUE in Vanga ranged from 5.33 to 6.52 Kg/fisher while that in Shimoni ranged from 4.88 to 6.04 kg/fisher. The length-frequency distribution for Octopus showed a peak at 60-69.5 cm total length.

Notes: 6148

Author Address: Kenya Marine and Fisheries Research Institute

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 149

Author: R. INCO-DC team: Hartnoll

Year: 2000

Title: A report on Macrobenthos of East Africa

Institution: Kenya Marine and Fisheries Research Institute

Publisher: ANNEXES-MEAM

Short Title: A report on Macrobenthos of East Africa

Keywords: Macrobenthos, Uca, mangroves.

Abstract: The report investigated the population dynamics and reproductive biology of key macrobenthic species. The work was designed to be carried out to common protocols at the four geographic locations in Africa, so that variables could be evaluated along a latitudinal gradient from Mombasa to Transkei in the South.

Notes: 6149

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book

Record Number: 150

Author: B. I. Everett, R. P. van der Elst and M. H. Schleyer

Year: 2008

Title: A natural history of the Bazaruto Archipelago, Mozambique

Publisher: South African Association for Marine Geographical Research

Series Volume: Special Publication no. 8

Number of Pages: 126

Pages: 126pp

Short Title: A natural history of the Bazaruto Archipelago, Mozambique

Keywords: Invertebrates, Sea grass beds, Species

Abstract: This publication is an overview of the ecology of Bazaruto Archipelago, Mozambique. It comprises a series of individual chapters compiled by different authors on topics ranging from its fauna and flora to its rich marine diversity, human population and conservation management. Whilst the content has a scientific basis, and will contribute to further scientific study and management of the region, it also considered to be a valuable source of information for tourists and others who visit the Island.

Notes: 6150

'File' Attachments: <internal-pdf://bazarutohandbook-2854960128/bazarutohandbook.pdf>

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 151

Author: D. E. Pollock

Year: 1998

Title: Spiny lobsters in the Indian ocean: Speciation in Relation to Oceanographic Ecosystems

Publisher: Wiley.com

Short Title: Spiny lobsters in the Indian ocean: Speciation in Relation to Oceanographic Ecosystems

Section: Kenya

Keywords: Spiny lobsters

oceanography

currents

Abstract: In the study of the effect of Agulhas current on speciation among spiny lobsters, evidence has been presented that suggests that speciation in the *P. homarus* group of spiny lobsters is accelerated during glacial periods when weaker, more discrete circulation patterns predominate in the north western Indian ocean. In contrast, stronger monsoon winds occurring during the interglacial periods allow for more extensive larval mixing in the north western Indian ocean which might possibly promote an increased frequency of hybridization between *P. homarus megasculptus* and *P. homarus*

Notes: 6151

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 152

Author: C. Conand and N. Muthiga

Year: 2008

Title: Commercial sea cucumbers: A review for the Western Indian Ocean.

Journal: WIOMSA

Volume: 5

Start Page: 66 p.

Short Title: Commercial sea cucumbers: A review for the Western Indian Ocean.

Legal Note: Kenya

Keywords: Sea cucumbers, harvest, commercial

Abstract: Sea cucumbers (Holothurians) are a group of marine invertebrates that are harvested worldwide, mostly for human consumption in Asian countries. Over the past decades, a significant increase in the demand for sea cucumbers has led to an explosion in exploitation, which often results in population declines in many producing nations. Because of the importance of sea cucumbers as a source of livelihood for many artisanal fishers from developing countries, and as a globally traded product, there is considerable interest in information on their biology, ecology and fisheries management. Although management

agencies and fishing communities recognize that sea cucumber fisheries are in trouble worldwide, attempts at management have been largely unsuccessful due to several factors including: 1) the vulnerability of sea cucumbers to harvesting, 2) the artisanal nature of the fishery, which prevents fishing communities from using alternative coping mechanisms, 3) the institutional and socioeconomic barriers to management. Sea cucumber production has been declining in nations of the Western Indian Ocean in the last 10 years. The reasons for the overexploitation include: 1) a lack of ecological information for understanding species life histories, 2) a lack of understanding of the socioeconomic realities of the fishery, and 3) inadequate monitoring and enforcement of fishery regulations.

Notes: 6152

'File' Attachments: internal-pdf://Book number 5-2584460801/Book number 5.pdf

Language: English

Reference Type: Conference Paper

Record Number: 153

Author: N. A. Muthiga, J. A. Kawaka and S. Ndirangu

Year: 2007

Title: The reproductive biology of the commercial sea cucumbers *Holothuria fuscogilva* and *Holothuria scabra* along the Kenyan coast

Conference Name: 5th WIOMSA Scientific Symposium

Publisher: WIOMSA

Pub Place: Kenya

Keywords: sea cucumbers , *Holothuria fuscogilva*, *Holothuria scabra*, reproduction

Abstract: The tropical sea cucumbers *Holothuria fuscogilva* and *Holothuria scabra* are amongst the most highly valued sea cucumbers that are widely distributed across the Western Indian Ocean. Despite their fisheries value, their biology, ecology and population dynamics remain poorly understood. The reproductive biology and ecology of these species was investigated in order to provide information that contributes to the improved management of sea cucumbers along the Kenyan coast. Distribution and abundance surveys were carried out using belt transects (2 x 100 m) from Kiunga south to Shimoni. Standard measurements of size, observations of gonad condition and sex and calculations of gonad and gut indices were used to analyze reproductive patterns of both species collected monthly between 2006–2007 and compared with data from a previous study in 1998–1999. Both species occurred at low densities ~ 0.1 ind 200 m⁻², *H. scabra* was more widely distributed occurring at sites from Kiunga to Shimoni while *H. fuscogilva* was only recorded south of Diani. Mean monthly gonad indices were significantly correlated between males and females ($r = 0.89$ and 0.60 for *H. fuscogilva* and *H. scabra* respectively) indicating synchronous gonad development between sexes. The pattern of gonad growth was less correlated between years ($r = 0.31$ and 0.46 for *H. fuscogilva* and *H. scabra* respectively). Gametogenesis commenced between April and May and peaked in November for *H. fuscogilva*. Gonad growth in *H. scabra* showed two peaks in March–June and September–October in 1998–1999 and only one peak in November–January in 2006–2007. The sexes did not differ in size in either species although females had significantly higher gonad indices in *H. fuscogilva* than males. *H. scabra*, the smaller sea cucumber had significantly lower gonad index and higher gut index, and the sex ratio was skewed towards more males. The life

history strategies of these species include spawning at the time favourable for larval growth and a high reproductive effort that may serve to increase reproductive success.

Notes: 6153

'File' Attachments: [internal-pdf://Nyawira et al WIOMSA-0807886342/Nyawira et al WIOMSA.pdf](#)

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 154

Author: S. Kohler, C. Conand and S. Gaudron

Year: 2007

Title: Reproductive biology of sea cucumbers from La Réunion: a contribution for a regional management of the fishery

Conference Name: 5th Western Indian Ocean Marine Science Association Scientific

Pub Place: Kenya

Keywords: Sea cucumber, *Holothuria leucospilota*, *Actinopyga echinites*

Abstract: The sea cucumber fishery is important in several countries of the Western Indian ocean (WIO) but generally not adequately managed. A regional programme (Masma) granted by Wiomsa is bringing data on the reproduction of most important beche de mer species. In La Reunion the two target species are *Holothuria leucospilota* and *Actinopyga echinites*. They are very abundant on the fringing reefs and were sampled monthly in 2005–2006. Data on the morphology, the histology of the gonads and the Gonad-Index were analysed. The main results concern the following parameters: the size distribution of the individuals within the population, the sex ratio, the anatomy of the gonads, the annual reproductive cycle and the size at first sexual maturity. These results are compared with data on other holothurian species such as *H. atra* and *Stichopus chloronotus* previously studied in La Reunion. The importance of fission is also discussed for the population parameters. These results will be useful for the research on the reproductive biology of sea cucumbers conducted in the other countries of WIO. The spawning season and the size at maturity will be useful for a future regional management of the stocks.

Notes: 6154

'File' Attachments: [internal-pdf://kohler0001-1412149254/kohler0001.pdf](#)

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 155

Author: D. Taddej, P. Frouin, J. Blanchot and C. Conand

Year: 2007

Title: Relation between nutrition of Holothurians and microbenthos of soft-bottoms in a shallow coral reef (Reunion Island)

Journal: SPC Beche de Mer Information Bulletin

Volume: 27

Short Title: Relation between nutrition of Holothurians and microbenthos of soft-bottoms in a shallow coral reef (Reunion Island)

Legal Note: Kenya

Keywords: Sea cucumber, *Holothuria leucospilota* and *Actinopyga echinites*.

Abstract: The sea cucumber fishery is important in several countries of the Western Indian ocean (WIO) but generally not adequately managed. A regional programme (Masma) granted by Wiomsa is bringing data on the reproduction of most important beche de mer species. In La Reunion the two target species are *Holothuria leucospilota* and *Actinopyga echinites*. They are very abundant on the fringing reefs and were sampled monthly in 2005–2006. Data on the morphology, the histology of the gonads and the Gonad-Index were analysed. The main results concern the following parameters: the size distribution of the individuals within the population, the sex ratio, the anatomy of the gonads, the annual reproductive cycle and the size at first sexual maturity. These results are compared with data on other holothurian species such as *H. atra* and *Stichopus chloronotus* previously studied in La Reunion. The importance of fission is also discussed for the population parameters. These results will be useful for the research on the reproductive biology of sea cucumbers conducted in the other countries of WIO. The spawning season and the size at maturity will be useful for a future regional management of the stocks.

Notes: 6155

'File' Attachments: <internal-pdf://BDM27-1315615488/BDM27.pdf>

Language: English

Reference Type: Journal Article

Record Number: 156

Author: J. Kolasinski

Year: 2007

Title: Toxicity biomarkers responses in holothurians species (La Reunion, Indian Ocean)

Journal: WIOMSA-SPC Beche de Mer Information Bulletin

Volume: 27

Short Title: Toxicity biomarkers responses in holothurians species (La Reunion, Indian Ocean)

Legal Note: Kenya

Keywords: Toxicity, biomarkers, sea cucumbers.

Abstract: The objective of this study was to assess toxicity biomarkers, acetylcholinesterase activity (AChE) and ethoxyrufin-O-deethylase activity (EROD), to elucidate any correlation with the eutrophication gradient. AChE is the functional target of insecticides, nematicides and chemical nerve agent. EROD activity is the main biotransformation process concerning the organic xenobiotics and then inform on any physiological induced stress. Significant variation was measured in AChE activity for *H. leucospilota*. The lowest value was found at the reference station ($293,9 \pm 72,4$ nmoles mgP-1 min-1) compared with the values in eutrophicated areas (548.0 ± 84.1 and 607.3 ± 72.2 nmoles mgP-1 min-1), what represent a 48% inhibition in the reference station. The EROD activity was measured for the first time on *H. leucospilota* and *H. atra*, and showed no significant difference between stations with 27.73 ± 25.19 to 68.73 ± 52.20 pmoles mgP-1 min-1 for *H. leucospilota* and 10.78 ± 7.55 to 20.33 ± 24.56 pmoles mgP-1 min-1 for *H. atra*.

Notes: 6156

URL: <http://www.spc.int/Coastfish/News/bdm/bdm.htm>

'File' Attachments: <internal-pdf://BDM27-2178976000/BDM27.pdf>

Language: English

Reference Type: Journal Article

Record Number: 157

Author: J. Ochiewo and M. de la Torre-Castro

Year: 2007

Title: The social and economic features of the sea cucumber fishery in Kenya

Journal: SPC Beche de Mer Information Bulletin

Volume: 27

Short Title: The social and economic features of the sea cucumber fishery in Kenya

Legal Note: Kenya

Keywords: Socio-economics, sea cucumber, Kenya.

Abstract: This paper presents the results of part of the Socio-economics component of a MASMA funded three-year sea cucumber project in the Western Indian Ocean (WIO) region. The objectives of this component of the project are 1) to determine the national marine resource use patterns, the social and economic characteristics of the fisher communities and the contribution of sea cucumbers to the national economies and local livelihoods of the coastal areas, and 2) to analyze the management system present in the area. The study has been conducted at Vanga, Shimoni, Majoreni and Gazi villages in the Kenyan south coast. The results indicate that sea cucumber collectors (fishers) are mainly men who fish in the sub-tidal areas between 3 and 10 metres deep. These fishers do not use scuba-diving gear and fishing is heavily done during the northeast monsoon season when the sea is calm and water is clear. About 50% of the sea cucumber fishers also collect other marine products such as octopus. The sea cucumbers are sold fresh from the sea to local dealers (middlemen) who process them and sell to more prominent middlemen in Mombasa and Kaloleni in the neighborhood of Mombasa. The fishers occasionally borrow money from dealers especially when they fail to catch sea cucumbers. This in turn makes them loyal to the dealers who lend them money thus creating conditions for exploitation. Almost all sea cucumber fishers have stated that they are not willing to make sea cucumbers part of their daily diet. Sea cucumber fishing is regulated by the Fisheries Department that issues fishing licenses. According to this law, fishers pay Kenya shillings 100 for the fishing license annually. However, a part from the main Fisheries legislation, there is no special law or policy that is devoted specifically to govern the sea cucumber fishery.

Notes: 6157

'File' Attachments: <internal-pdf://BDM27-0659565056/BDM27.pdf>

Language: English

Reference Type: Journal Article

Record Number: 158

Author: J. A. K. a. N. A. Muthiga

Year: 2007

Title: Annual reproduction in the Indo-Pacific sea cucumber *Holothuria leucospilota* as a

response to variability in the environment

Journal: WIOMSA

Volume: SPC Beche de Mer Information Bulletin #27

Short Title: Annual reproduction in the Indo-Pacific sea cucumber *Holothuria leucospilota* as a response to variability in the environment

Legal Note: Kenya

Keywords: Holothurians, management programs, *Holothuria leucospilota*

Abstract: The world-wide decline in wild stocks of holothurians or sea cucumbers has generated a great deal of interest for reproduction and fisheries biology information that could lead to the development of better management programs as well as aquaculture of this valuable resource. Sea cucumbers have been collected for export in the WIO since the early 1900s, however, reports of declining stocks has led to concerns about the better management of this fishery. This paper discusses the findings of a study on the distribution, abundance and reproduction of the sea cucumber *Holothuria leucospilota* a commercial species that is widely distributed throughout the Western Indian Ocean (WIO). The species was selected as an appropriate model as part of a broader program to assess the status, biology and ecology of sea cucumbers of the WIO funded by the Western Indian Ocean Marine Science Association. Our objective was to assess the status of this sea cucumber under different management regimes (protection vs. fishing), as well as study the reproductive strategy and how environmental factors influence this strategy. The population assessment was carried out along the Kenyan coast using belt transects (100 m x 2 m) and time searches. The Gonad Index (GI) method was used to investigate the changes associated with gonad development of individuals collected in the Mombasa Marine Reserve. Results indicated that *H. leucospilota* is distributed throughout the Kenyan coast and that the abundance and biomass of sea cucumbers is dependent on habitat (higher abundances in coral reefs, and reef lagoons) as well as management regime (population densities were higher in protected than unprotected reefs). In addition, the pattern of reproduction indicated that *H. leucospilota* has a seasonal reproductive pattern, with gametogenesis beginning in November and spawning occurring in March. The estimated size at sexual maturity for this sea cucumber was 18 cm. The study provides information on stocks as well as sea cucumber biology that should contribute to the sustainable management of sea cucumbers as well as information for the development of mariculture in this region.

Notes: 6158

'File' Attachments: internal-pdf://BDM27-3022721281/BDM27.pdf

Language: English

Reference Type: Journal Article

Record Number: 159

Author: E. N. Kimani, K. M. Mavuti and T. Mukiyama

Year: 2006

Title: The reproductive cycle of the pearl oyster *Pinctada imbricata* in Gazi bay, Kenya.

Journal: Journal of Tropical Zoology

Volume: 19

Pages: 159-174

Short Title: The reproductive cycle of the pearl oyster *Pinctada imbricata* in Gazi bay, Kenya.

Legal Note: Kenya

Keywords: Reproductive cycle, *Pinctada imbricate*, Gazi bay, Kenya

Abstract: This paper describes the reproductive activity of the pearl oyster *Pinctada imbricata* Röding 1798 in two adjacent areas in Gazi Bay, Kenya, exposed to different tidal current velocity. The annual mean temperature, salinity, suspended matter and organic content of the suspended matter were similar in the two areas. Gonad activity and spawning of the oyster population occurred throughout the year. Male sex expression was higher than female sex expression, and also higher in the current swept area (m:f = 1:0.72) than in the sheltered area (m:f = 1:0.81). The developing gonad stages were more abundant during the southeast monsoon period between July and October, while spent stages were more abundant between May, July and between November and February. The condition index indicated similar gonad development patterns at the two sites and was higher in the current swept site during most of the year.

Notes: 6159

'File' Attachments: internal-pdf://Kimani et alii 550[1]-1197047296/Kimani et alii 550[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 160

Author: K. M. Mavuti, E. Kimani and T. K. Mukiyama

Year: 2005

Title: The growth patterns of the pearl oyster *Pinctada margaritifera* in Gazi bay, Kenya.

Journal: African Journal of Marine Science

Volume: 27

Issue: 3

Pages: 567-575

Short Title: The growth patterns of the pearl oyster *Pinctada margaritifera* in Gazi bay, Kenya.

Legal Note: Kenya

Keywords: Growth rate, Kenya, monsoon seasons, nacre deposition, *Pinctada margaritifera*, tidal currents

Abstract: Culture of pearl oysters is rapidly increasing worldwide, including the western Indian Ocean. The oyster *Pinctada margaritifera* L., which produces the most highly valued black pearls, occurs in East Africa, has been exploited there for the shell for many decades. The growth patterns of *P. margaritifera* from a natural population in the sheltered back-reef, from oysters translocated to a tidal current-swept site, both sites within Gazi Bay, Kenya, are described. The growth rate in the natural population ranged from 31.3mm year⁻¹ (60–65mm size-class) to 7.6mm year⁻¹ (105–110mm sizeclass). The von Bertalanffy growth calculated with a fixed L_{∞} of 127.2mm, was 0.30 for the natural population 0.38 for the translocated oysters. The mean growth rate during the north-east monsoon season was approximately double that for during the south-east monsoon season. The daily rate of nacre deposition ranged from 1.3µm to 5.9µm (mean 3.45µm); it declined with the size of oysters was marginally higher at the high-energy current site. At that rate, it would take approximately two years to produce a marketable cultured half pearl with a 2.5mm layer of nacre. The results of the study are relevant to the understanding of the influence of the environment on growth, are applicable to

the optimisation of growth rate of pearl oysters in the inshore region along the east coast of Africa.

Notes: 6160

'File' Attachments: internal-pdf://Mavuti_et_al-2155551488/Mavuti_et_al.pdf

Language: English

Reference Type: Journal Article

Record Number: 161

Author: E. N. Kimani and K. M. Mavuti

Year: 2002

Title: The abundance and population structure of pearl oyster, *Pinctada margaritifera* L.1758 (Bivalvia; Pteriidae) in Kenya

Journal: Western Indian Ocean Journal of Marine Sciences

Volume: 2

Pages: 169-179

Date: 2002

Type of Article: Journal Article

Short Title: Western Indian Ocean J. Mar. Sci.

ISSN: 0856-860x

Legal Note: Kenya

Keywords: Abundance

population structure

Pinctada margaritifera

Kenya

Abstract: Pearl oysters are an important marine resource within the Indo-Pacific oceans. They are widely cultured for the production of black pearls, their flesh is eaten, and their shell, known as mother-of-pearl (MOP) is used in the ornament and button industry. The blacklip pearl oyster, *Pinctada argaritifera* L., has been harvested from East Africa for MOP for decades. A survey within nearshore habitats in Kenya showed that *Pinctada margaritifera* is widely distributed in shallow lagoons, bays and channels. Other oyster species found during the survey were the wing oyster, *Pteria penguin*, occurring in deep channels in Shimoni and Mombasa, and *Pt. chinensis*, within lagoons and channels in Malindi, Mombasa and Shimoni. *Pinctada margaritifera* was most abundant in Gazi Bay within sheltered back reefs and lagoon, and on an intertidal reef flat and back reef in Shimoni. Mean abundance and sizes declined with depth. The abundance of *Pi. margaritifera* in Kenya was higher than reported in the Pacific Islands and similar to abundances reported in India. The overall mean (34 mm) and maximum (154 mm) sizes were lower than those reported in the Pacific Ocean, but similar to sizes in India and the Red Sea. The oysters matured before reaching 40 mm (dorsal-ventral length), principally as males. Male sex expression was dominant, and more so in samples from moorings and jetty fouling where density was exceptionally high. The high population densities, high temperature variation and high suspended matter of relatively poor quality in the nearshore shallow lagoon environment may explain the observed life history pattern observed in the oyster populations. This study is the first comprehensive report on pearl oyster populations in Kenya.

Notes: 6161

URL: www.oceandocs.org/bitstream/1834/39/1/WIOJ12169.pdf

'File' Attachments: <internal-pdf://WIOJ12169-2223150848/WIOJ12169.pdf>

Author Address: Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya

Language: English

Reference Type: Journal Article

Record Number: 162

Author: E. N. Kimani, K. M. Mavuti and T. Mukiama

Year: 1996

Title: The larval development and juvenile growth of the silver mouth turban, *Turbo argyrostomus* (Mollusca, Prosobranchia).

Journal: Asian Journal of Marine Biology

Volume: 13

Pages: 105-116.

Short Title: The larval development and juvenile growth of the silver mouth turban, *Turbo argyrostomus* (Mollusca, Prosobranchia).

Legal Note: Kenya

Keywords: Larval development, juvenile growth, *Turbo argyrostomus*.

Notes: 6162

'File' Attachments: <internal-pdf://Kimani-0476549633/Kimani.pdf>

Language: English

Reference Type: Conference Paper

Record Number: 163

Author: E. Fondo

Year: 2003

Title: The Status of Kenyan Marine Biodiversity

Conference Location: Cape Town

Publisher: University of Cape Town

Date: 23-26 September 2003:

Type: Proceedings report

Pub Place: Kenya

Keywords: Marine biodiversity, Kenya, threats, taxa

Abstract: A summary of the coastal ecosystems and resources of Kenya, the known and unknown about the marine biodiversity, threats to biodiversity and capacity.

Notes: 6163

'File' Attachments: [internal-pdf://mosoti\[1\]-2105680640/mosoti\[1\].pdf](internal-pdf://mosoti[1]-2105680640/mosoti[1].pdf)

Author Address: Kenya Marine and Fisheries Research Institute

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 164

Author: E. O. Wakwabi

Year: 1990

Title: Stock assessment from applying length based cohort and catch curve analyses.

Conference Name: Proceedings of the Workshop on the management of the shallow water shrimp fishery of Tanzania July 18-27

Conference Location: Tanzania

Publisher: KMFRI

Pages: 60-68

Date: 1990

Pub Place: Kenya

Keywords: length
mathematical models
population structure
shrimp fisheries
size distribution
stock assessment

Abstract: The findings are presented of a stock assessment carried out on the Tanzanian shrimp fisheries, considering both the artisanal fishery sector and the industrial trawling sector. Catch predictions were made by the computer programme BEAM IV and 2 methods were applied to estimate mortality rate for the 2 major species *Penaeus indicus* and *Metapenaeus monoceros* -- length converted catch curve analysis and Jones' length converted cohort analysis. The analysis shows that at the mortality coefficient estimated, only 1% of the recruiting shrimps remain alive after 1 year, only 3% after 6 months and only 17% after 3 months. It is concluded that the fishery must be managed within the limits of these parameters

Notes: 6164

'File' Attachments: [internal-pdf://Wakwabii-2802030592/Wakwabii.pdf](#)

Author Address: Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 165

Author: T. R. McClanahan and R. Arthur

Year: 2001

Title: The effect of marine reserves and habitat on populations of East African coral reef fishes

Journal: Ecological Applications

Volume: 11

Issue: 2

Pages: 559-569.

Short Title: The effect of marine reserves and habitat on populations of East African coral reef fishes

Legal Note: Kenya

Keywords: community structure, coral reef ecology, East African coral reefs, fish ecology,

fishing effects, fringing and patch reef ecology, habitat effects, marine protected areas, population variability, rarity

Abstract: The effects of fishing, the duration of protection from fishing, features of the reef habitat, including benthic cover and sea urchin abundance, and the distance between reefs were examined to determine the ability of these factors to predict ecological aspects of fish communities. Population density, species richness, and rarity were estimated for 127 species of coral reef fish on 22 patch and fringing reefs along 400 km of East African coastline. The reefs included five protected areas, of which three study sites were protected for more than 25 years, and four sites were protected less than 10 years. Habitat variables were often significantly associated with fish community variables in fringing reefs, but not in patch reefs. Fish diversity was positively correlated with hard coral and coralline algal cover, and negatively correlated with sea urchin and algal turf abundance. However, multiple regression analysis suggests that protection from fishing was the single strongest factor affecting fish abundance and diversity. Consequently, many of the habitat correlations were probably due to direct and indirect effects of fishing on reef ecology, where heavy fishing results in increases in sea urchin and algal turf abundance and reduces hard coral and coralline algal abundance. Protected areas had higher abundances and species richness of commercially important triggerfish, surgeonfish, and parrotfish. There was, however, no relationship between local rarity in our study sites with rarity at the level of the western Indian Ocean for three well known fish families of angelfish, butterflyfish, and damselfish. Older reserves had more and rarer species than young reserves or fished reefs; and, consequently, the maintenance of reserves older than 10 years may be needed to sustain the full local diversity of fishes.

Notes: 6165

'File' Attachments:

internal-pdf://McClanahan_Arthur_01-0337075456/McClanahan_Arthur_01.pdf

Language: English

Reference Type: Journal Article

Record Number: 167

Author: T. R. McClanahan and R. Arthur

Year: 1995

Title: Fish predators and scavengers of the sea urchin *Echinometra mathaei* in Kenyan coral-reef marine parks

Journal: Environmental Biogogy of Fishes

Volume: Vol 43 No. 2

Pages: 187-193

Short Title: Fish predators and scavengers of the sea urchin *Echinometra mathaei* in Kenyan coral-reef marine parks

Legal Note: Kenya

Keywords: *Balistapus undulatus* - Fishery management - Keystone predator - Triggerfish - Wrasses - Fishes

Abstract: Predation on 120 adult sea urchins of the species *Echinometra mathaei* was observed during daylight in shallow-water coral reefs (0.5 to 3 m deep) in a variety of sites in 3 Kenyan marine parks. The predators were few (8 species) and dominated by the triggerfish *Balistapus*

undulatus (65 % of all observations) followed by terminal-male wrasses *Coris formosa*, *C. aygula* and *Cheilinus trilobatus*, and lastly the scavenger *Lethrinus mahsena*. Those species that attempted, but failed, to prey on *E. mathaei* were slightly more numerous (11 species), while scavengers of opened carcasses were the most speciose (20 species). Based on these observations, it is suggested that *B. undulatus* is a keystone predator and that fishery regulations that protect this species may be necessary in order to reduce the detrimental consequences of high sea urchin abundance — such as high reef substrate erosion and competitive exclusion of fishes.

Notes: 6167

'File' Attachments: <internal-pdf://McClanahan95-1779418368/McClanahan95.pdf>

Language: English

Reference Type: Journal Article

Record Number: 168

Author: T. R. McClanahan, N. A. J. Graham, J. M. Calnan and M. A. MacNeil

Year: 2007

Title: TOWARD PRISTINE BIOMASS: REEF FISH RECOVERY IN CORAL REEF MARINE PROTECTED AREAS IN KENYA.

Journal: USA Ecological Applications

Volume: Vol. 17, No. 4

Pages: 1055-1067

Short Title: TOWARD PRISTINE BIOMASS: REEF FISH RECOVERY IN CORAL REEF MARINE PROTECTED AREAS IN KENYA.

Legal Note: Kenya

Keywords: coral reef ecology, ecological interactions, ecological succession, fisheries closures, fisheries production, fisheries yields, indirect effects, marine reserves, marine protected areas, maximum sustained yield, MSY, spill over

Abstract: Identifying the rates of recovery of fish in no-take areas is fundamental to designing protected area networks, managing fisheries, estimating yields, identifying ecological interactions, and informing stakeholders about the outcomes of this management. Here we study the recovery of coral reef fishes through 37 years of protection using a space-for-time chronosequence of four marine national parks in Kenya. Using AIC model selection techniques, we assessed recovery trends using five ecologically meaningful production models: asymptotic, Ricker, logistic, linear, and exponential. There were clear recovery trends with time for species richness, total and size class density, and wet masses at the level of the taxonomic family. Species richness recovered rapidly to an asymptote at 10 years. The two main herbivorous families displayed differing responses to protection, scarids recovering rapidly, but then exhibiting some decline while acanthurids recovered more slowly and steadily throughout the study. Recovery of the two invertebrate-eating groups suggested competitive interactions over resources, with the labrids recovering more rapidly before a decline and the balistids demonstrating a slower logistic recovery. Remaining families displayed differing trends with time, with a general pattern of decline in smaller size classes or small-bodied species after an initial recovery, which suggests that some species- and size-related competitive and predatory control occurs in older closures. There appears to be an ecological succession of dominance

with an initial rapid rise in labrids and scarids, followed by a slower rise in balistids and acanthurids, an associated decline in sea urchins, and an ultimate dominance in calcifying algae. Our results indicate that the unfished "equilibrium" biomass of the fish assemblage >10 cm is 1100–1200 kg/ha, but these small parks (<10 km²) are likely to underestimate pre-human influence values due to edge effects and the rarity of taxa with large area requirement, such as apex predators, including sharks.

Notes: 6168

'File' Attachments: [internal-pdf://McClanahan_mpa-0588925696/McClanahan_mpa.pdf](#)

Language: English

Reference Type: Journal Article

Record Number: 171

Author: T. R. McClanahan and R. Arthur

Year: 1994

Title: Kenyan coral reef lagoon fish: effects of fishing, substrate complexity, and sea urchins

Journal: Coral Reefs

Volume: 13

Issue: 4

Short Title: Kenyan coral reef lagoon fish: effects of fishing, substrate complexity, and sea urchins

Alternate Journal: SpringerLink

Legal Note: Kenya

Keywords: Coral reef fish families, population density, fish species, diversity, sea urchins, Marine Protected Areas

Abstract: Population density, number of species, diversity, and species-area relationships of fish species in eight common coral reef-associated families were studied in three marine parks receiving total protection from fishing, four sites with unregulated fishing, and one reef which recently received protection from fishing (referred to as a transition reef). Data on coral cover, reef topographic complexity, and sea urchin abundance were collected and correlated with fish abundance and species richness. The most striking result of this survey is a consistent and large reduction in the population density and species richness of 5 families (surgeonfish, triggerfish, butterflyfish, angelfish, and parrotfish). Poor recovery of parrotfish in the transition reef, relative to other fish families, is interpreted as evidence for competitive exclusion of parrotfish by sea urchins. Reef substrate complexity is significantly associated with fish abundance and diversity, but data suggest different responses for protected versus fished reefs, protected reefs having higher species richness and numbers of individuals than unprotected reefs for the same reef complexity. Sea urchin abundance is negatively associated with numbers of fish and fish species but the interrelationship between sea urchins, substrate complexity, coral cover, and management make it difficult to attribute a set percent of variance to each factor-although fishing versus no fishing appears to be the strongest variable in predicting numbers of individuals and species of fish, and their community similarity. Localized species extirpation is evident for many species on fished reefs (for the sampled area of 1.0 ha). Fifty-two of 110 species found on protected reefs were not found on unprotected reefs.

Notes: 6171

'File' Attachments:

internal-pdf://McClanahan_231-241-2182471168/McClanahan_231-241.pdf

Language: English

Reference Type: Journal Article

Record Number: 172

Author: J. Ochiwo

Year: 2004

Title: Changing fisheries practices and their socioeconomic implications in South Coast Kenya

Journal: Ocean & Coastal Management

Volume: Volume 47

Issue: Issues 7-8

Pages: Pages 389-408

Short Title: Changing fisheries practices and their socioeconomic implications in South Coast Kenya

Legal Note: Kenya

Keywords: Fishing practices, socioeconomic impacts, fisheries management, vessels, gears

Abstract: A study conducted in South Coast, Kenya to determine the factors that influence the harvesting of fish in the area, assess the changes that have occurred in local fishing practices and their socioeconomic impacts; establish stakeholder characteristics in relation to changing fishing practices; and identify the winners and losers in the changing fisheries management regimes. Information and data were collected from four sites, namely Vanga, Shimoni, Msambweni and Gazi. It was established that changing fishing practices in the area have led to over-exploitation of the fish stocks from the coral reefs. Regression analysis of the data indicated a significant inverse relationship between fish harvesting rate and price. This is inconsistent with the theory of production, which predicts output to increase with increase in price. In the study area, when the price of fish is low, fishermen tend to spend more hours per day fishing in order to compensate for the lost income due to price decrease. This results in over-fishing within the coral reef. Similarly, the output has a significant inverse relationship with distance to the fishing ground. There is a significant positive relationship between effort and output; when fishing effort increases by one unit, output increases by 0.43 units in weight. The other explanatory variables, particularly income, education and age, have a positive but insignificant relationship with output; the adjusted R² is 0.714, which means that these variables explain 71% of the variation in output. From the estimation of a transformed log-log model, the results obtained are consistent with the estimates of the original model.

Notes: 6172

'File' Attachments: internal-pdf://Ochiwo04-3635588096/Ochiwo04.pdf

Language: English

Reference Type: Journal Article

Record Number: 173

Author: D. O. Obura, S. Wells, J. Church and C. Horrill

Year: 2002

Title: Monitoring of fish and fish catches by local fishermen in Kenya and Tanzania

Journal: Marine and Freshwater Research

Volume: 53

Issue: 2

Pages: 215 - 222

Short Title: Monitoring of fish and fish catches by local fishermen in Kenya and Tanzania

Legal Note: Kenya

Keywords: Monitoring, fish names, resource management

Abstract: Monitoring of fish populations underwater and of fish catches is being undertaken at several sites in Kenya and Tanzania using local names and languages. This paper describes the programmes underway at Kiunga Marine Reserve and Diani-Chale in Kenya, and at Tanga in Tanzania. At all three sites, standard protocols have been adapted for use by local fishermen, who have been trained to collect data. A key factor enabling this has been to use local knowledge as the foundation of monitoring. The paper discusses some of the difficulties encountered, such as variations in the use of names, and generally low literacy among fishermen. Overall, the benefits far outweigh the disadvantages in terms of developing a much greater sense of involvement in, and participation by, the fishing communities in the management of their resources. The programmes are also providing the fishermen with a deeper understanding of the impact of fishing on their resources and thus will help them to apply appropriate management approaches.

Notes: 6173

'File' Attachments: internal-pdf://Obura02[1]-0158861313/Obura02[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 174

Author: B. Kaunda-Arara, G. A. Rose, M. S. Muchiri and R. Kaka

Year: 2003

Title: Long-term Trends in Coral Reef Fish Yields and Exploitation Rates of Commercial Species from Coastal Kenya

Journal: Western Indian Ocean Journal of Marine Science

Volume: 2

Issue: 2

Pages: 105-116

Date: 2003

Type of Article: Journal Article

Short Title: West. Indian Ocean J. Mar. Sci.

ISSN: 0856-860X

Legal Note: Kenya

Keywords: coral reef fish

yield

long term trends

commercial fishing

Kenya

Abstract: Analysis of long-term (1978–2001) marine fisheries data showed that Kenyan

coralreefs produced an estimated 2–4 metric t/km²/year of demersal fish. A rapid overall decline in landings occurred during the 1990s. Yields (t/km²/year) showed bimodal peaks in 1982 (2.98) and 1991 (2.90). The average total landings dropped by 55% during the last decade following peak landings in 1982. Landings of the commercially important families (e.g., Siganidae, Lethrinidae, Lutjanidae and Serranidae) declined by about 40% during the last decade, with the groupers (Serranidae) showing the steepest (72%) decline. Analysis of landings per administrative district showed a 78% decline in the densely populated Mombasa district between the periods 1983–1991 and 1992–2001. The less populated districts have registered stable (e.g., Kilifi) to increasing (e.g., Kwale) catches over time. An autoregressive moving average (ARIMA) model forecast of landings predicted a gradual decline in catches during the next decade (2002– 2011) with a trend slope of -0.01 t/km². Length-frequency analysis for the commercially important species indicated above optimum exploitation (E) and fishing mortality (per year) rates for the sky emperor, *Lethrinus mahsena* (E = 0.64; F = 2.48) and lower but strong rates for the emperor, *L. sanguineus* (E=0.51; F=0.93). The more abundant and commercially important whitespotted rabbitfish, *Siganus sutor*, showed equally strong rates (E= 0.56; F = 1.44/year). A precautionary approach in the management of Kenya's coral-reef fisheries is recommended.

Notes: 6174

URL: ajol.info/index.php/wiojms/article/view/28437/22085

'File' Attachments: internal-pdf://28437-33131-1-PB-3631242752/28437-33131-1-PB.pdf

Author Address: Department of Fisheries, Moi University, P.O. Box 1125, Eldoret, Kenya

Language: English

Reference Type: Journal Article

Record Number: 175

Author: B. Kaunda-Arara and G. A. Rose

Year: 2004

Title: Effects of marine reef National Parks on fishery CPUE in coastal Kenya

Journal: Biological Conservation

Volume: 118

Issue: 1

Pages: 1-13

Short Title: Effects of marine reef National Parks on fishery CPUE in coastal Kenya

Legal Note: Kenya

Keywords: Fish yields; Marine protected areas; Monsoons; Patch reefs; Spillover-model; *Siganus sutor*; *Lethrinus mahsena*

Abstract: The role of marine protected areas in conserving fish stocks and their potential influence on adjacent fisheries was studied at Malindi and Watamu Marine National Parks, Kenya (established in 1968). For most species catch per unit effort (CPUE) in traditional Dema traps fished across park boundaries was higher within the parks (up to an order of magnitude). However, a few species (e.g., the seagrass parrotfish, *Leptoscarus vaigensis* and the whitespotted rabbitfish, *Siganus sutor*, WSR) had higher seasonal CPUE outside the parks. Potential spillover of fishes from the parks to adjacent fished areas was tested with a logistic “decay” model of density gradients (CPUE) across park borders from fringing and patch reefs. A

steep decay in CPUE off the Malindi patch reef suggested little spillover of most species. However, greater spillover was suggested off fringing reefs. Species differences were evident. The two most important commercial species showed different density gradients. Species diversity declined more abruptly off the fringing reefs. We conclude that although spillover of most species from the parks is limited, the most important commercial species exhibits significant spillover to adjacent fisheries and the Parks likely comprise important nursery and growth areas for other species.

Notes: 6175

'File' Attachments: <internal-pdf://Kaunda-arara04-2891457792/Kaunda-arara04.pdf>

Language: English

Reference Type: Book

Record Number: 176

Author: K. Sherman, E. Okemwa and M. Ntiba

Year: 1998

Title: Large Marine Ecosystems of the Indian Ocean: Assessment. Sustainability and Management

Publisher: Wiley-Blackwell

Short Title: Large Marine Ecosystems of the Indian Ocean: Assessment. Sustainability and Management

ISBN: 978-0-632-04318-7

Keywords: LMEs, Indian Ocean

Abstract: In this volume marine experts from countries of East Africa and southern Asia describe the conditions of marine resources of the large marine ecosystems of the Indian Ocean. Countries of the region represent over a quarter of the world's population, most of whom are existing at or below the poverty level. The potentials for economic growth through the development of coastal tourism, mariculture, fisheries, mineral extraction, and oil and gas production are examined by the authors in relation to the need for ensuring the long-term sustainability of marine resources. Case studies of resource assessments presented by several authors illustrate the magnitude of risk from continuing degradation of resources under the prevailing unmanaged conditions extending over much of coastal areas of East Africa and southern Asia. The authors explore the application of multidisciplinary ecosystem-based assessment and management strategies to the future economic development of the large marine ecosystems of the region. With the initiation of science-based management practices, the ecosystems of the area can provide an important source of economic growth, improved food security, and nutritional benefits to the populations of stakeholders in coastal areas bordering the Indian Ocean

Notes: 6176

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 177

Author: T. R. McClanahan, J. Maina and J. Davies

Year: 2005

Title: Perceptions of resource users and managers towards fisheries management options in Kenyan coral reefs

Journal: Fisheries Management and Ecology

Volume: 12

Issue: 2

Pages: 105 - 112

Short Title: Perceptions of resource users and managers towards fisheries management options in Kenyan coral reefs

Legal Note: Kenya

Keywords: area management, artisanal fishing, attitudinal survey, gear management, marine parks

Abstract: The perceptions of Kenyan resource users and managers towards gear and area management were examined through face-to-face interviews to identify areas of agreement and disagreement and compare with compliance. Opinions were sought about gears that sustained fish catch, gears discouraged by the government and traditional leaders, and the benefits of area management were sought. There was good agreement among most groups and traditional leaders about the gears discouraged by government, with beach seines and spear guns the most commonly listed. This indicates good agreement between government and traditions, promoted by recent government legislation, but compliance was poor since nearly two-thirds of fishers used these recently prohibited gears. This was due, in part, to lesser agreement concerning gears that promote a sustainable fishery, with spear guns and beach seines scaled low, but moderately supported in this respect by those fishers that use these gears. These gears persist because of the lack of shared evidence about the yields and sustainability of the various gears and social and economic aspects, such as increased competitiveness and decreased costs of the gears. There is evidence that beach seines lower yields but this gear persists because it is more competitive and has lower costs to the user than the other gears. Spear guns also persist because young and poor fishermen, who cannot afford costs associated with other gears, use them. Government employees scaled the benefits of area, and particularly closed area, management, higher than fishers, which is an issue of conflict but, nonetheless, has good compliance because of the long history of closed area management. For both types of management, shared perceptions alone were insufficient to achieve high compliance, and active enabling and enforcement by managers is needed.

Notes: 6177

'File' Attachments: <internal-pdf://maina05-2730750720/maina05.pdf>

Language: English

Reference Type: Journal Article

Record Number: 178

Author: S. Jennings and N. V. C. Polunin

Year: 1996

Title: Impacts of Fishing on Tropical Reef Fishes

Journal: Ambio

Volume: 25

Issue: 1

Pages: 44-49

Short Title: Impacts of Fishing on Tropical Reef Fishes

Legal Note: Kenya

Keywords: Fisheries, ecosystem shift, tropical reefs, yield

Abstract: Fishing is the most wide spread human exploitative activity on tropical reefs and the survival of many coastal societies is dependent on the productivity of their fisheries. Existing fishery management strategies focus primarily on target fish populations, but they may not be appropriate when fishing initiates shifts in the reef ecosystem. Such shifts may not be reversible and can impair the processes which guarantee future fish production. We describe a number of alternative approaches to management and consider which of these may help to maximize yield whilst minimizing the probability of unwanted ecosystem shifts. One of these approaches is already adopted by a number of Island societies but ironically it has proved to be incompatible with many fishery development programs.

Notes: 6178

'File' Attachments: internal-pdf://Ambio3[1]-2065304320/Ambio3[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 179

Author: H. Glaesel

Year: 2000

Title: State and Local Resistance to the Expansion of Two Environmentally Harmful Marine Fishing Techniques in Kenya

Journal: Society and Natural Resources

Volume: 13

Issue: 4

Pages: 321-338

Date: 2000

Type of Article: Journal Article

Short Title: State and Local Resistance to the Expansion of Two Environmentally Harmful Marine Fishing Techniques in Kenya

Legal Note: Kenya

Keywords: COASTAL; KENYA; IDENTITY; POLITICS; MARINE; MANAGEMENT; POLITICAL; Ecology, systematics, crabs, perisesarma

Abstract: Disputes over use of the marine environment in coastal East Africa have been on the rise for several decades. Recent discord among fishers and between fishers and the state stems from (1) declining catches and fish stocks, part of a global crisis in nearshore fisheries; (2) increasing use of fishing techniques harmful to the marine environment; and (3) fishers' loss to marine parks of access to waters they once fished. Increasingly, fishing technique more than place of birth, residence, or marriage ties has been used by customary and state authorities to determine fishing rights. This article examines the twentieth-century expansion of two environmentally harmful fishing techniques, pull seining and speargunning. It is argued that although local fishers and pull seiners generally share religion, language, and coastal origins,

and speargunners largely do not, the greater negative environmental change enacted by seiners makes them the prime target of local resistance. Conflicts among fishers using different techniques and conflicts between fishers and the state have transformed both formal and informal marine management systems such that they offer less protection to marine environments than intended.

Notes: 6179

URL:

<http://www.ingentaconnect.com/content/routledg/usnr/2000/00000013/00000004/art00002>

Language: English

Reference Type: Journal Article

Record Number: 180

Author: T. R. McClanahan, H. Glaesel, J. Rubens and R. Kiambo

Year: 1997

Title: The effects of traditional fisheries management on fisheries yields and the coral-reef ecosystems of southern Kenya

Journal: Environmental Conservation

Volume: 24:2

Pages: 105-120

Short Title: The effects of traditional fisheries management on fisheries yields and the coral-reef ecosystems of southern Kenya

Legal Note: Kenya

Keywords: common property resource; coral-reef ecology; fisheries tradition; fisheries methods and yields; human ecology.

Abstract: Many traditions of coastal peoples may be viewed as traditional forms of marine conservation because, like modern fisheries management, they restrict fishing gear, fishing times, and places, but their effects are little studied in practice. A study was undertaken of human culture and fisheries resources in an area of southern Kenya, designated as a national marine reserve, to determine the effect of the existing 'traditional management' on fisheries yields and on the ecological condition of the fished reefs. This area has one of the oldest and most elaborate cultural traditions concerning sacred sites and rituals of sacrifice along the Kenyan coast. The purpose of the customs is, however, to appease spirits rather than to regulate fish stocks which are traditionally seen to fluctuate independently of fishing effort. Many of these traditions have decayed in recent times as Islamization of the culture has occurred, and authority has shifted towards national organizations, weakening the effectiveness of the traditional leaders. Coincidentally, fishers have adopted new or foreign gear, colleagues, and traditions. Two adjacent landing sites (Mvuleni and Mwanyaza) have, however, successfully stopped pull seiners from landing their catch at their sites for over 20 years through passive means. Other landing sites have adopted pull seining. Both landing areas use arguments based on tradition to justify their use of gear. The two landings that restrict pull seining have higher per capita fish catches than those that do not. Nonetheless, there were no obvious differences in the ecological condition of the reefs at these two management areas; both areas were amongst the most degraded reefs reported in East Africa. Biological diversity and coral cover were reduced greatly in all these areas compared to other fished or

fully-protected marine park or reserve sites established by the national government. Presently, traditional management is not effective in protecting species diversity or ecological functions, which was probably never the intention of the customs. The conflict between national organizations and local fishers arises because some resource users are concerned that the management proposed by the national organizations will eventually lead to the total loss of access to, and control of the resource by local fishers. There is, therefore, a need to resolve conflicts concerning gear use and regulation, and a need to increase awareness of the expectations and management programmes among the national and local organizations. Many of the traditional forms of management are compatible with the policies of national organizations, but confusion and conflict occur concerning enforcement and its benefits. To solve these conflicts discussions are required between traditional and national fisheries leaders to develop mutually-acceptable policies that augment and share the power of management.

Notes: 6180

URL: <http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=38141>

Language: English

Reference Type: Journal Article

Record Number: 181

Author: S. Fleischer and L. Stibe

Year: 1989

Title: Agriculture Kills Marine Fish in the 1980s. Who Is Responsible for Fish Kills in the Year 2000?

Journal: Ambio

Volume: 18

Issue: 6

Pages: 347-350

Short Title: Agriculture Kills Marine Fish in the 1980s. Who Is Responsible for Fish Kills in the Year 2000?

Legal Note: Kenya

Keywords: Fish kills, Harmful algal blooms, Nitrogen

Abstract: Coastal water eutrophication as a result of excessive Nitrogen input has gradually increased in the Kattegat and led to severe stress in the whole of the estuary, leading to fish kills. Harmful algal blooms have led to death of large quantities of algae, fish and bottom fauna. Agriculture is the major source of Nitrogen and hence the fish kills.

Notes: 6181

URL: <http://www.jstor.org/pss/4313607>

'File' Attachments: internal-pdf://Ambio[1]-4263449344/Ambio[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 182

Author: B. Kaunda-Arara and M. J. Ntiba

Year: 1997

Title: The reproductive biology of *Lutjanus fulviflamma* (Forsskål,1775) (Pisces: Lutjanidae) in

Kenyan inshore marine waters

Journal: Hydrobiologia

Volume: 353

Issue: 1-3

Pages: 153-160

Type of Article: Journal Article

Short Title: The reproductive biology of *Lutjanus fulviflamma* (Forsskål, 1775) (Pisces: Lutjanidae) in Kenyan inshore marine waters

ISSN: 0018-8158.

Legal Note: Kenya

Keywords: maturation cycle

spawning season

fecundity

oocyte recrudescence

Abstract: The testicular and ovarian maturation cycle of the dory snapper, *Lutjanus fulviflamma* (Forsskål) (Osteichthyes: Lutjanidae), a commercially valuable species in the western Indian Ocean, is described macroscopically. The ovary was also studied microscopically. *L. fulviflamma* has one prolonged spawning season which begins from November/December, lasting till April/May. Discontinuous spawning is established by (i) temporal variation in the relative weight of testis and ovaries, (ii) a seasonal occurrence of various maturity stages and, (iii) a seasonal occurrence of developing fish in the samples. Using volumetric and histological techniques, the fecundity of this species was determined at 51,000 to 460,000 (mean: 167,000) oocytes in fish of between 17 to 30 cm total length, respectively. Oocyte recrudescence in the ovary is asynchronous, but the number and size of batches of eggs released in a single spawning season are yet to be determined.

Notes: 6182

'File' Attachments: <internal-pdf://Kaunda-Arara-0975333376/Kaunda-Arara.pdf>

Language: English

Reference Type: Journal Article

Record Number: 183

Author: T. R. McClanahan, J. Maina and L. Pet-Soede

Year: 2002

Title: Effects of the 1998 Coral Mortality Event on Kenyan Coral Reefs and Fisheries

Journal: Ambio

Volume: 31

Issue: 7

Pages: 543–550

Short Title: Effects of the 1998 Coral Mortality Event on Kenyan Coral Reefs and Fisheries

Alternate Journal: The Royal Swedish Academy of Sciences

Legal Note: Kenya

Keywords: Coral reef, fish, algae, coral bleaching, CPUE

Abstract: Data were collected in southern Kenya on coral reef ecosystems and fisheries to assess the influence of the 1998 coral bleaching and mortality event. We compared benthic

cover, sea urchin and fish abundance in unfished marine parks and fished reefs and the reef-associated fisheries 3 years before and after 1998. Hard and soft coral decreased while coralline algae increased in both management areas. Turf increased in marine parks and sponge and fleshy algae increased in the fished reefs. Sea urchin grazer biomass was unchanged over this period and the fish community changed less than benthic cover. In general, butterflyfish, damselfish and wrasses were negatively influenced while surgeonfish and a few uncommon families were positively influenced by the substratum change. There was a 17% increase in fishing effort as measured by fishermen per day at each landing site and the total demersal catch declined by 8% and the catch per man declined by 21% after 1998. The decline in the total catch and CPUE combined with the increase in effort suggest an overexploited fishery and this makes it difficult to distinguish changes caused by coral mortality or fishing effort. The price of fish increased over this period and this caused an 18% increase in the total value of the fishery but no difference in the net income of individual fishermen.

Notes: 6183

'File' Attachments: <internal-pdf://McClanahan02-4278663168/McClanahan02.pdf>

Language: English

Reference Type: Report

Record Number: 184

Author: T. de Sousa

Year: 1986

Title: Summary of fisheries and resources information for Kenya

Institution: FAO

Publisher: FAO

Type: Technical Report

Short Title: Summary of fisheries and resources information for Kenya

Keywords: Artisanal fishery, survey, Ungwana Bay, stock assessment, fish biology, growth, mortality

Abstract: The artisanal fishery is shown as providing some 92 percent of the overall annual catch from marine waters of 10,688 tonnes in 1984. The latter derived from the use of slightly less than 2,000 boats, mostly of traditional type. The number of fishermen involved is not known, but was probably around 4,500 persons. Reference is made to a small fleet of semi-industrial trawlers operated from Mombasa. These are used mainly in Ungwana Bay for catching shallow-water shrimps and fish (by-catch). The reported landings for 1984 show 294 tonnes (whole weight) of shrimps and 445 tonnes of fish from six trawlers and a transport vessel. The catch of shrimps is compared with estimates for their biomass in Ungwana Bay (and nearby Sabaki/Mambrui) from trawl surveys during 1970, which ranged from 112 tonnes (March) to 353 tonnes (May). Various interpretations of the results of surveys undertaken from the R/V Prof. Mesyatsev and R/V Dr Fridtjof Nansen are shown to indicate potential annual yields of about 10,000 tonnes for each of the demersal and small pelagic species. These surveys were largely undertaken offshore from the grounds fished by the artisanal fishermen. Exploitation of these fish in the near future has been claimed as unlikely, because of generally low densities and the poor commercial value of the species present. Reference is made to unsuccessful attempts to develop offshore trawling for deep-water shrimp (*Heterocarpus*

woodmasoni) and lobster (*Puerulus angulatus* and *Metanephrops andamanicus*) following exploratory trawl surveys from the F/V Ujuzi. The densest concentrations were located off Ungwana Bay, for which the potential annual yields were given as 108 tonnes for the shrimps and 140 tonnes for the lobster. The paper also includes summaries of the results from a number of biological and stock assessment studies for particular species. Estimates of the growth and mortality parameters are provided for each of the grunt (*Pomadasys opercularis*), the thumbprint monocle bream (*Scolopsis bimaculatus*), the spotted sicklefish (*Drepane punctata*), the rabbitfish (*Siganus sutor*) and the giant tiger prawn (*Penaeus monodon*).

Notes: 6184

URL: <http://www.fao.org/docrep/field/303859/30385904.htm>

'File' Attachments: internal-pdf://De_Saousa-0017521152/De_Saousa.htm

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 185

Author: P. Rönnbäck, I. Bryceson and K. N.

Year: 2002

Title: Coastal Aquaculture Development in Eastern Africa and the Western Indian Ocean: Prospects and Problems for Food Security and Local Economies

Journal: Ambio

Volume: 31

Issue: 7

Pages: 537–542

Short Title: Coastal Aquaculture Development in Eastern Africa and the Western Indian Ocean: Prospects and Problems for Food Security and Local Economies

Legal Note: Kenya

Keywords: Aquaculture, feed, fry, mangroves

Abstract: This paper reviews the experience and status of coastal aquaculture of seaweeds, mollusks, fish and crustaceans in eastern Africa and the islands of the western Indian Ocean. In many respects, coastal aquaculture is still in its infancy in the region, and there is a pressing need to formulate development strategies aimed at improving the income and assuring the availability of affordable protein to coastal communities. This paper also draws from positive and negative experiences in other parts of the world. The requirements of feed and fry, and the conversion of mangroves are used to illustrate how some aquaculture activities constitute a net loss to global seafood production. The paper presents both general and specific sustainability guidelines based on the acknowledgement of aquaculture as an ecological process. It is concluded that without clear recognition of its dependence on natural ecosystems, the aquaculture industry is unlikely to develop to its full potential in the region.

Notes: 6185

'File' Attachments: [internal-pdf://jhhexx1027-537\[1\]-1698641921/jhhexx1027-537\[1\].pdf](internal-pdf://jhhexx1027-537[1]-1698641921/jhhexx1027-537[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 186

Author: M. J. Ntiba and V. Jaccarini

Year: 1988

Title: Age and growth parameters of *Siganus sutor* in Kenyan marine inshore water, derived from numbers of otolith microbands and fish lengths

Journal: Journal of Fish Biology

Volume: 33

Pages: 465-470

Date: 1988

Type of Article: Journal Article

Short Title: Age and growth parameters of *Siganus sutor* in Kenyan marine inshore water, derived from numbers of otolith microbands and fish lengths

Legal Note: Kenya

Keywords: *Siganus sutor*, age, growth, stock assessment, otoliths

Abstract: *Siganus sutor* (Valenciennes, 1835) is, together with the Lethrinidae, commercially the most important fish of Kenyan waters. Age and growth parameters of this fish have been estimated for stock assessment purposes, using the von Bertalanffy growth model while taking into account the initial small but finite length of fish, L_0 . Microbands on the otoliths were used as a measure of age in days. Data of fish length against numbers of microbands were fitted to the growth formula by a least squares procedure applied to a non-linear fit. This gave an L , of 36.2 cm and a K of 0.87 on an annual basis. Independently, a curve was fitted by eye to the same data, and values were read off the curve and used in a standard Ford-Walford plot. This gave an L , of 35 cm and a K of 0.9. The close agreement of the values obtained by the two methods, and of these with values in the literature, demonstrates the value of using microbands for determining growth parameters in a tropical fish.

Notes: 6186

'File' Attachments: [internal-pdf://Ntiba-0623102720/Ntiba.pdf](#)

Language: English

Reference Type: Journal Article

Record Number: 187

Author: B. I. Crona

Year: 2006

Title: Supporting and Enhancing Development of Heterogeneous Ecological Knowledge among Resource Users in a Kenyan Seascape

Journal: Ecology and Society

Volume: 11

Issue: 1

Pages: 32-45

Type of Article: Journal Article

Short Title: Supporting and Enhancing Development of Heterogeneous Ecological Knowledge among Resource Users in a Kenyan Seascape

Legal Note: Kenya

Keywords: heterogeneous; local ecological knowledge (LEK); seascape; Kenya; East Africa;

artisanal fishery

Abstract: The heterogeneous nature of even small communities has been acknowledged, yet how such heterogeneity is reflected in local ecological knowledge (LEK) among groups of resource users in a community is poorly studied. This study examines the ecological knowledge held by fisher groups using differing gear and operating in different subsystems of a coastal seascape in south Kenya. Knowledge is compared to that of nonfishing groups and is analyzed with respect to the scales of ecological processes and disturbances affecting the ecosystem to identify mismatches of scale between local knowledge and ecological processes, as well as points of convergence upon which emerging scientific and local community information exchange can build and develop. Results reveal significant differences in the level and content of ecological knowledge among occupational categories with respect to the scale and nature of ecological interactions in the seascape. Nonfishing related groups were marked by consistently low levels of knowledge and understanding of all seascape components and processes. Gear-defined fisher groups appeared linked, through fishing methods, to specific functional groups defined by trophic level, although acknowledgment among users of trophic links and ecosystem effects were not always apparent. Knowledge appeared to be largely related to maximization of resource extraction rather than reflecting deep understanding of ecological processes and causal links. Demographic changes and erosion of traditional management systems may partly explain this. Based on the results it is suggested that future investments geared at enhancing socioeconomic standards, e.g., through investment in improved gear, run the risk of further propelling the system down the poverty trap through habitat degradation and stock depletion, if not simultaneously combined with support for development and enhancement of existing LEK.

Notes: 6187

URL: <http://www.ecologyandsociety.org/vol11/iss1/art32/>

'File' Attachments: internal-pdf://Crona-3432160000/Crona.pdf

Language: English

Reference Type: Journal Article

Record Number: 188

Author: M. C. M. Beveridge, L. G. Ross and L. A. Kelly

Year: 1994

Title: Aquaculture and Biodiversity

Journal: Ambio

Volume: 23

Issue: 8

Pages: 497-502

Short Title: Aquaculture and Biodiversity

Legal Note: Kenya

Keywords: Aquaculture, biodiversity

Abstract: The impacts of aquaculture on biodiversity are rarely positive, sometimes neutral, but usually negative to some degree. Impacts arise from the consumption of resources, such as land (or space), water, seed and feed, their transformation into products valued by society and the production of wastes (uneaten food, faecal and urinary products, chemotheraputants,

microorganisms and parasites and feral farmed organisms). Negative impacts may be direct, through the introduction of exotic genetic material into the environment for example, or indirect through loss of habitat and niche space. It is concluded that the key issues in deciding the acceptability of this method of food production are scale, intensity of resource use, and net production of wastes. It is also argued that protection of biodiversity is essential from the aquaculturist's point of view.

Notes: 6188

URL: <http://www.jstor.org/pss/4314267>

'File' Attachments: internal-pdf://Ambio1[1]-1595795456/Ambio1[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 189

Author: R. van der Elst, B. Everett, N. Jiddawi, G. Mwatha, P. S. Afonso and D. Boulle

Year: 2005

Title: Fish, Fishers and Fisheries of the Western Indian Ocean: Their Diversity and Status. A Preliminary Assessment

Journal: Philosophical Transactions: Mathematical, Physical and Engineering Sciences

Volume: 363

Issue: 1826

Pages: 263-284

Short Title: Fish, Fishers and Fisheries of the Western Indian Ocean: Their Diversity and Status. A Preliminary Assessment

Legal Note: Kenya

Keywords: Western Indian Ocean Fisheries, small-scale fisheries, fisheries management, biodiversity

Abstract: The Western Indian Ocean represents ca. 8% of the world's oceans but generates only 4% of the global industrial catch. This region is also home to a great proportion of the world's population, living in developing countries with a high dependence on marine resources. Trends in the declared landings of marine resources from the Western Indian Ocean suggest that this ocean may be approaching its maximum harvest potential of ca. 4 Mt per annum, but underreported artisanal catches complicate more-detailed analyses. There is a growing demand for 'new resources' to make up for declining stocks, while several large fluctuations are linked to changes in market demand and over exploitation. Artisanal fisheries in the region are highly diversified. Preliminary results are presented of a project that evaluates the conservation status and sustainable management practices in 168 different fishery types. It is concluded that the majority of the region's artisanal fisheries are not adequately supported by scientific information and that management strategies need to be improved if the enormous development challenges of East African countries are to be met.

Notes: 6189

URL: <http://rsta.royalsocietypublishing.org/content/363/1826/263.full.pdf>

'File' Attachments: internal-pdf://Elst05-3226027264/Elst05.pdf

Language: English

Reference Type: Magazine Article

Record Number: 190

Author: N. Muthiga, L. Bigot and A. Nilsson

Year: 1998

Title: East Africa: Coral reef programs of eastern Africa and the Western Indian Ocean

Magazine: UNEP

Place Published: UNEP

Publisher: UNEP

Frequency: Proceedings Article

Short Title: East Africa: Coral reef programs of eastern Africa and the Western Indian Ocean

Keywords: Coral reef, ecosystems

Abstract: This report gives an updated description of the coral reef and associated ecosystem programs of the Eastern African mainland states, which include the nations of Somalia, Kenya, mainland Tanzania, Zanzibar and Mozambique as well as the Western Indian Ocean island states of Comoros, Madagascar, Mauritius, Reunion and Seychelles.

Notes: 6190

URL:

http://gridnairobi.unep.org/chm/EAFDocuments/Eastern_Africa/reefbase_ITMEMS_1998_EastAfrica.pdf

'File' Attachments:

[internal-pdf://reefbase_ITMEMS_1998_EastAfrica\[1\]-1613534721/reefbase_ITMEMS_1998_EastAfrica\[1\].pdf](internal-pdf://reefbase_ITMEMS_1998_EastAfrica[1]-1613534721/reefbase_ITMEMS_1998_EastAfrica[1].pdf)

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 191

Author: M. A. K. Ngoile and O. Linden

Year: 1997

Title: Lessons learned from Eastern Africa: The development of policy on ICZM at national and regional levels

Journal: Ocean & Coastal Management

Volume: 37

Issue: 3

Pages: 295-318

Short Title: Lessons learned from Eastern Africa: The development of policy on ICZM at national and regional levels

Legal Note: Kenya

Keywords: Coastal zone, overexploitation, marine pollution

Abstract: Coastal zones of Eastern Africa are endowed with a diversity of life forms and resources which support large populations of coastal communities. The economies of the countries in the region are dependent on these resources in the form of fisheries and coastal forest products, tourism, shipways and coastal facilities such as ports, industries and urban centers. Population growth, especially in coastal urban centers is increasing the demand for

coastal and marine resources. In addition, poverty, lack of awareness and inadequate management have resulted in over exploitation of coastal and marine resources, habitat destruction including shoreline erosion as well as marine pollution. The rate of resource depletion and environmental degradation is on the increase. There is an urgent need for instituting management measure that will reverse the current trend. The governments in the region have accepted and are committed to the implementation of Integrated coastal management (ICZM) as an effective mechanism for addressing and resolving the multiplicity of issues experienced in coastal areas through sectoral coordination and collaborative approaches. However, the process has just begun and there are a number of ICZM initiatives in progress at local, national and regional levels. This paper presents the issues of the coastal zone and reviews some of the progress made to date in the implementation of ICZM.

Notes: 6191

'File' Attachments: internal-pdf://Ngoile97-3601965056/Ngoile97.pdf

Language: English

Reference Type: Book

Record Number: 192

Author: T. R. McClanahan, J. Maina and J. Davies

Year: 2007

Title: Management of Area and Gear in Kenyan Coral Reefs

Series Editor: J. C. C. T. R. McClanahan

Publisher: Blackwell Publishers

Short Title: Management of Area and Gear in Kenyan Coral Reefs

Keywords: MPAs, gears, fisheries, fish species

Abstract: Gives history of Kenyan fisheries and gears, the history of MPAs, perceptions towards protected areas and the effects of MPAs in fish abundance, diversity and spillover.

Notes: 6192

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 193

Author: S. C. Mangi, C. M. Roberts and L. D. Rodwell

Year: 2007

Title: Reef fisheries management in Kenya: Preliminary approach using the driver–pressure–state–impacts–response (DPSIR) scheme of indicators

Journal: Ocean & Coastal Management

Volume: 50

Issue: 5-6

Pages: 463-480

Short Title: Reef fisheries management in Kenya: Preliminary approach using the driver–pressure–state–impacts–response (DPSIR) scheme of indicators

Legal Note: Kenya

Keywords: Reef fisheries, management

Abstract: This paper reviews the present state of reef fishing activities in Kenya and the tropics using the driver–pressure–state–impacts–response (DPSIR) framework. It identifies appropriate indicators that would evaluate the problem of overfishing and the use of destructive fishing gear, and discusses policy considerations for the Kenyan small-scale fishery. We conclude that the DPSIR framework works well at simplifying the complexity of reef fisheries management and serves to inform policy makers, scientists and general public on the relevance of indicators to monitor changes in the status of reefs.

Notes: 6193

'File' Attachments: <internal-pdf://Mangi07-0581903872/Mangi07.pdf>

Language: English

Reference Type: Journal Article

Record Number: 194

Author: D. O. Obura

Year: 2001

Title: Kenya

Journal: Marine Pollution Bulletin

Volume: 42

Issue: 12

Pages: 1264-1278

Short Title: Kenya

Legal Note: Kenya

Keywords: Kenya, marine environments, threats, management

Abstract: The Kenya coast is bathed by the northward-flowing warm waters of the East Africa Coastal Current, located between latitudes 1 and 5° S. With a narrow continental shelf, the coastal marine environments are dominated by coral reefs, seagrass beds and mangroves, with large expanses of sandy substrates where river inputs from Kenya's two largest rivers, the Tana and Athi rivers, prevent the growth of coral reefs. The northern part of the coast is seasonally influenced by upwelling waters of the Somali Current, resulting in lower water temperatures for part of the year. The coast is made up of raised Pleistocene reefs on coastal plains and hills of sedimentary origin, which support native habitats dominated by scrub bush and remnant pockets of the forests that used to cover East Africa and the Congo basin. The marine environment is characterized by warm tropical conditions varying at the surface between 25°C and 31°C during the year, stable salinity regimes, and moderately high nutrient levels from terrestrial runoff and groundwater. The semi-diurnal tidal regime varies from 1.5 to 4 m amplitude from neap to spring tides, creating extensive intertidal platform and rocky-shore communities exposed twice-daily during low tides. Fringing reef crests dominate the whole southern coast and parts of the northern coast towards Somalia, forming a natural barrier to the wave energy from the ocean. Coral reefs form the dominant ecosystem along the majority of the Kenya coast, creating habitats for seagrasses and mangroves in the lagoons and creeks protected by the reef crests. Kenya's marine environment faces a number of threats from the growing coastal human population estimated at just under three million in 2000. Extraction of fish and other resources from the narrow continental shelf, coral reef and mangrove ecosystems increases each year with inadequate monitoring and management structures to

protect the resource bases. Coastal development in urban and tourist centers proceeds with little regard for environmental and social impacts. With a faltering economy, industrial development in Mombasa proceeds with few checks on pollution and other impacts. In 1998 Kenya's coral reefs suffered 50–80% mortality from the El Niño-related coral bleaching event that affected the entire Indian Ocean. The institutional, human resource and legal infrastructure for managing the coastal environment has in the past been low, however these are rapidly improving with the revitalization of national institutions and the passing in 1999 of an Environment Act. Marine Protected Areas are the key tool currently used in management of marine ecosystems, and focus principally on coral reefs and biodiversity protection. New initiatives are underway to improve application of fisheries regulations, and to use Integrated Coastal Area Management (ICAM) as a framework for protecting marine and coastal environments.

Notes: 6194

'File' Attachments: [internal-pdf://Obura2001\[1\]-0746640385/Obura2001\[1\].pdf](internal-pdf://Obura2001[1]-0746640385/Obura2001[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 195

Author: A. Cros and T. R. McClanahan

Year: 2003

Title: Coral transplant damage under various management conditions in the Mombasa Marine National Park, Kenya

Journal: Western Indian Ocean Journal of Marine Science

Volume: 2

Issue: 2

Pages: 127-136

Date: 2003

Type of Article: Journal Article

Short Title: Coral transplant damage under various management conditions in the Mombasa Marine National Park, Kenya

ISSN: 0856-860X

Legal Note: Kenya

Keywords: beach seining

corallivory

fishing gear

marine protected areas

Porites

reef management

reef rehabilitation

Kenya, Indian Ocean

Abstract: Two coral species, *Porites palmata* and *Porites lutea*, were transplanted into three distinct management areas adjacent to the Mombasa Marine National Park, Kenya: A no-fishing MPA; a gear-restricted reserve with no beach seining; and a reserve with beach seining. Corallivory by fish or breakage by fishing gear was measured over a 57-day period. *Porites*

palmata, the branching species, was more susceptible to disturbance than *Porites lutea*, the massive species, which showed no difference in mortality rate between the three management areas. *Porites palmata* was affected more by corallivory than fishing gear and, therefore, suffered more damage from coral predators in the no-fishing MPA. Corals transplanted into the gearrestricted fishing site had the highest survival. The damage from predators was small and seldom resulted in total colony mortality, which was common in the fishing area with beach seining.

Notes: 6195

URL: ajol.info/index.php/wiojms/article/view/28434/22082

'File' Attachments: internal-pdf://WIOJ22127-2991922176/WIOJ22127.pdf

Author Address: Department of Marine Sciences and Coastal Management, University of Newcastle Upon Tyne, Ridley Building, Newcastle upon Tyne United Kingdom

Language: English

Reference Type: Journal Article

Record Number: 196

Author: R. M. Nzioka

Year: 1990

Title: Fish yield of Kilifi coral reef in Kenya

Journal: Hydrobiologia

Volume: 208

Issue: 1-2

Pages: 81-84

Type of Article: Journal Article

Short Title: Fish yield of Kilifi coral reef in Kenya

ISSN: 0018-8158.

Legal Note: Kenya

Keywords: Fish

yield

coral

reef

artisanal

fishery

Abstract: The fish yield on Kilifi reef which is about 4 km² was estimated for three years: 1982–1984. It was found that the yield on the reef ranged from 5.07 t km⁻² to 12.9 t km⁻² with a mean of 8.8 t km⁻² year⁻¹. The major groups of fish caught were mostly Siganidae, Scaridae, Plectorhynchidae, Scombridae, Lutjanidae, Serranidae, Carangidae, Sphyreanidae and Ceasioididae. There were more fish caught during the northeast monsoon when the sea was calm than during the southeast monsoon when the sea was rough.

Notes: 6196

URL: <http://www.springerlink.com/content/y637136h9071kk42/>

'File' Attachments: internal-pdf://Nzioka-2288183552/Nzioka.pdf

Language: English

Reference Type: Journal Article

Record Number: 197

Author: T. R. McClanahan, C. C. Hicks and E. S. Darling

Year: 2008

Title: MALTHUSIAN OVERFISHING AND EFFORTS TO OVERCOME IT ON KENYAN CORAL REEFS.

Journal: Ecological Applications:

Volume: Vol. 18

Issue: No. 6

Pages: pp. 1516-1529

Short Title: MALTHUSIAN OVERFISHING AND EFFORTS TO OVERCOME IT ON KENYAN CORAL REEFS.

Alternate Journal: Ecological Society of America

Legal Note: Kenya

Keywords: artisanal fisheries, demographic change, gear use and management, fisheries closures, fisheries yields, Kenya, marine protected areas, resource competition, social–ecological systems

Abstract: This study examined trends along a gradient of fishing intensity in an artisanal coral reef fishery over a 10-year period along 75 km of Kenya's most populated coastline. As predicted by Malthusian scenarios, catch per unit effort (CPUE), mean trophic level, the functional diversity of fished taxa, and the diversity of gear declined, while total annual catch and catch variability increased along the fishing pressure gradient. The fishery was able to sustain high ($16 \text{ Mg} \cdot \text{km}^{-2} \cdot \text{yr}^{-1}$) but variable yields at high fishing pressure due to the dominance of a few productive herbivorous fish species in the catch. The effect of two separate management strategies to overcome this Malthusian pattern was investigated: fisheries area closure and elimination of the dominant and most “competitive” gear. We found that sites within 5 km of the enforced closure showed significantly lower total catch and CPUE, but increased yield stability and trophic level of catch than predicted by regression models normalized for fishing effort. Sites that had excluded illegal beach seine use through active gear management exhibited increased total catch and CPUE. There was a strong interaction between closure and gear management, which indicates that, for closures to be effective at increasing catch, there must be simultaneous efforts at gear management around the periphery of the closures. We propose that Malthusian effects are responsible for the variation in gear and catch and that active management through reduced effort and reductions in the most competitive gear have the greatest potential to increase the functional and trophic diversity and per-person productivity.

Notes: 6197

'File' Attachments: <internal-pdf://MALTHUSIAN-1796657665/MALTHUSIAN.pdf>

Language: English

Reference Type: Book Section

Record Number: 198

Author: D. O. Obura, I. N. Wanyonyi and J. M. Mwaura

Year: 2002

Title: Participatory Monitoring of an Artisanal Fishery in Kenya

Book Title: Coral Reef Degradation in the Indian Ocean. Status Report 2002

Publisher: CORDIO

Pages: 70-82

Series Editor: D. S. O. Linden, D. Wilhelmsson & D. Obura

Short Title: Participatory Monitoring of an Artisanal Fishery in Kenya

Section: Kenya

Keywords: artisanal fishery, Kenya, participatory monitoring, western Indian Ocean

Abstract: Improved and increased monitoring of coral reef status and fishery production is a core need for improving coral reef fisheries management in Kenya. In the past, this has been done primarily by scientists and government officers, who are in limited supply. This paper presents a case study of the expansion of monitoring to artisanal fishermen, through participatory monitoring methods in the Diani region of Kenya, starting in 1998. Fishers are involved in monitoring of landed catch, underwater visual census of fish, and socio-economic variables. The paper presents an analysis of aspects of the data collected, focussing on linkages among the monitoring areas on the issue of gear choice by fishers and implications for management of the fishery. Spearguns are increasingly used by new and poor fishers due to their low cost (US\$ 1.33) and ease of use, and probably also because of their marginally higher productivity than alternative gear of similar and even moderate cost (US\$210). With the banning of spearguns by a Fisheries Department directive in 2001, considerable conflict may ensue as increasing poverty among fishers forces more of them to take up spearguns, despite the illegality of the gear. Additionally, the paper presents the argument that by involving fishers in monitoring, their acceptance of, and empowerment in management is increased to the benefit of all stakeholders, particularly themselves.

Notes: 6198

'File' Attachments: internal-pdf://CORDIO 2002-4230919680/CORDIO 2002.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 199

Author: N. K. Gitonga and R. Achoki

Year: 2003

Title: Fiscal reforms for Kenya fisheries

Institution: FAO

Pages: 19-

Publisher: FAO

Type: Technicle report

Short Title: Fiscal reforms for Kenya fisheries

Abstract: Kenya's Fisheries sub-sector has the potential to significantly contribute to the national economy through employment creation, foreign exchange earnings, poverty reduction and food security support. The annual fish production in Kenya is approximately 200 000 tonnes earning the fishers over Kshs 7 billion (approximately US\$90 million). The common nature of the natural fishery resources renders it vulnerable to mismanagement because they are open

to use by everyone and, therefore, not looked after by anyone.

Notes: 6199

URL: <http://www.fao.org/docrep/007/y5718e/y5718e04.htm>

'File' Attachments: [internal-pdf://y5718e00\[1\]-2572920832/y5718e00\[1\].pdf](internal-pdf://y5718e00[1]-2572920832/y5718e00[1].pdf)

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 200

Author: B. Kaunda-Arara

Year: 1996

Title: Analysis of fish catch data from 1985 to 1994 in the Kenyan inshore marine waters

Journal: African Journal of Tropical Hydrobiology and Fisheries

Volume: 7

Issue: 1

Pages: 1-6

Date: 1996

Type of Article: Journal Article

Short Title: Analysis of fish catch data from 1985 to 1994 in the Kenyan inshore marine waters

Legal Note: Kenya

Notes: 6200

Language: English

Reference Type: Journal Article

Record Number: 201

Author: FAO

Year: 2006

Title: SOUTH WEST INDIAN OCEAN FISHERIES COMMISSION: Report of the FIRST SESSION OF THE SCIENTIFIC COMMITTEE Dar es Salaam, United Republic of Tanzania, 31 May-3 June 2006

Journal: FAO Fisheries Report

Issue: 806

Pages: 79p

Type of Article: FAO Report

Short Title: SOUTH WEST INDIAN OCEAN FISHERIES COMMISSION: Report of the FIRST SESSION OF THE SCIENTIFIC COMMITTEE Dar es Salaam, United Republic of Tanzania, 31 May-3 June 2006

Legal Note: Kenya

Keywords: Fisheries resources, fish stocks, bycatch, discards

Abstract: The first session of the Scientific Committee of the South West Indian Ocean Fisheries Commission was attended by delegates from Comoros, European Community, France, Kenya, Madagascar, Maldives, Mauritius, Mozambique, Seychelles, Somalia and the United Republic of Tanzania. Representatives of the Swedish International Development Cooperation Agency (Sida), the South West Indian Ocean Fisheries Project (SWIOFP), the Regional Seas Programme of the United Nations Environment Programme (UNEP) and the World Wide Fund for Nature

(WWF) also attended the Session as observers. The Scientific Committee elected its first Chairperson and Vice-Chairperson and examined: the status of fisheries resources in its area of competence; the ecosystem approach to fisheries research and assessment activities; and working parties.

Notes: 6201

'File' Attachments: <internal-pdf://a0695b00-2786481408/a0695b00.pdf>

Language: English

Reference Type: Journal Article

Record Number: 202

Author: P. Bliss-Guest

Year: 1983

Title: Environmental Stress in the East African Region

Journal: Ambio

Volume: 12

Issue: 6

Pages: 290-295

Short Title: Environmental Stress in the East African Region

Legal Note: Kenya

Keywords: Marine environment, pollution

Abstract: The marine environment of the East African Region is not severely polluted and could actually be considered "clean" when compared with the seas receiving wastes from more industrialized societies, such as the Baltic, the North Sea and the Mediterranean. Rather, the marine and coastal environment of East Africa is threatened mostly by the failure of the Region's governments to incorporate sound environmental management policies in the planning process. This article presents an overview of the sources of environmental stress in the East African Region.

Notes: 6202

'File' Attachments: [internal-pdf://Ambio2\[1\]-4045088768/Ambio2\[1\].pdf](internal-pdf://Ambio2[1]-4045088768/Ambio2[1].pdf)

Language: English

Reference Type: Conference Paper

Record Number: 203

Author: T. R. McClanahan, R. Arthur, B. Kaunda-Arara, R. Kiambo, H. Machano, S. Mangi, N. Muthiga and M. Rodrigues

Year: 2000

Title: Sea urchin reduction as a restoration technique in a new marine park

Conference Name: Proceedings 9th International Coral Reef Symposium

Conference Location: Bali, Indonesia

Publisher: Coral Reef Symposium

Volume: Vol. 2

Date: 23-27 October 2000

Type: Proceedings Article

Pub Place: Kenya

Keywords: Coral cover, Experimental management, Habitat restoration, Park management, Spatial and temporal scales

Abstract: Coral reefs degraded from heavy fishing may require both fisheries management and habitat manipulation in order to promote desired species of fishes and corals. High population densities of sea urchins is a common form of reef degradation and this study compares two efforts to determine the effects of sea urchin reduction on reef ecology. These experiments were undertaken after protection from fishing to determine if sea urchin reduction combined with reduced fishing would promote the recovery of hard corals and finfishes. Experiments were done at two scales, a small (~ 50 m x 50 m) area studied for one year and a large (100 m x 100 m) area studied for three years. Both experiments found increases in fleshy algae, estimates of total finfish wet weights, and particularly parrotfish, wrasses and scavengers biomass after the manipulation. Changes in fish wet weights were smaller in the large compared to the small-scale experiments which suggests a dilution effect with the increasing spatial scale of the manipulation. The small-scale manipulation produced a loss while the large-scale manipulation produced an increase in hard coral cover. In both cases this appeared to be caused by an initial rapid increase in fleshy algae during the first 200 days of the experiment. Afterwards, fleshy algae decreased and hard coral increased. The decrease in fleshy algae and increase in hard coral were probably attributable to increased herbivory and seasonal storms. The eventual loss of algae combined with reduced sea urchin grazing promoted hard corals. Sea urchin reduction after the cessation of fishing is a useful reef restoration technique but requires fishing restrictions and time to promote coral recovery

Notes: 6203

'File' Attachments:

internal-pdf://McClanahanTR_etal[1]-0017978625/McClanahanTR_etal[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 204

Author: D. Oyugi

Year: 2005

Title: Preliminary investigations in the Ichthyodiversity of Kilifi Creek, Kenya

Journal: Western Indian Ocean Journal of Marine Science

Volume: 4

Issue: 1

Pages: 11-20

Date: 2005

Type of Article: Journal Article

Short Title: Western Indian Ocean J. Mar. Sci.

ISSN: 0856-860X

Legal Note: Kenya

Keywords: Ichthyodiversity

hill's indices

Kilifi creek

spatial variation
sampling

Abstract: In order to determine fish spatial variation, the Kilifi Creek was divided into three sampling zones: entrance, middle zone, and Creek end. Sampling was by both gill and cast nets. Hill's diversity indices were used as a measure of spatial diversity variance. A total of 95 species from 45 families were recorded. *Gerres filamentosus*, *Pomadasys multimaculatum*, *Leiognathus equula* and *Terapon theraps* occurred commonly. Highest species richness (No = 68) and diversity ($N1 = 31.09$) was recorded at the entrance and Creek middle respectively. Most of the species overlap with the highest overlap index ($L = 2.52$) recorded between *Cynoglossus gilchristi* and *Scombroides lysan*. The creek's ichthyodiversity show considerable variability, with the high richness at the entrance attributed to the presence of open water visitor species. The high number of species compares well to records from Gazi Bay and mida Creek with some species not found further south.

Notes: 6204

URL: ajol.info/index.php/wiojms/article/view/28469/5149

'File' Attachments: [internal-pdf://28469-16195-1-PB-2627268352/28469-16195-1-PB.pdf](#)

Author Address: IUCN-EARO, P.O. Box 68200 Nairobi, Kenya

Language: English

Reference Type: Journal Article

Record Number: 205

Author: S. C. Mangi and C. M. Roberts

Year: 2007

Title: Factors influencing fish catch levels on Kenya's coral reefs

Journal: Fisheries Management and Ecology

Volume: 14

Issue: 4

Pages: 245 - 253

Short Title: Factors influencing fish catch levels on Kenya's coral reefs

Legal Note: Kenya

Keywords: Corals

fish

fishing effort

fishing gear

Kenya

sea urchins

Abstract: The factors influencing fish catches on Kenya's coral reefs were studied. Catch data were collected at the species level by counting the number of fish landed at each landing site of each fishing ground. Live coral cover, topographic complexity, fish and sea urchin density, and the number of fishers and gear units used in each fishing ground were compared with catch data. Fishing grounds included one location where only basket traps were allowed, six locations where all gear types were used except beach seines, and three locations where all types of gear, including beach seines, were used. Catch and effort variables were similar across the fishing

grounds whereas live coral cover and sea urchin density differed ($P < 0.01$). The sites fished by all types of gear including beach seines had the lowest coral cover ($8.4 \pm 0.9\%$) and topographic complexity (1.12 ± 0.01). Catch levels were positively correlated with the number of fishers and fish density but not with the number of gear units deployed or sea urchin density. The number of fishers and live coral cover were the strongest factors determining total catch levels. The results suggest that high levels of fishing effort coupled with the use of destructive gear types, exacerbate the effects of overfishing on Kenya's reefs.

Notes: 6205

'File' Attachments: internal-pdf://Mangi-Issue 4-1469912064/Mangi-Issue 4.pdf

Language: English

Reference Type: Journal Article

Record Number: 206

Author: R. Abila, M. Barluenga, J. Engelken, A. Meyer and W. Salburger

Year: 2004

Title: Population-structure and genetic diversity in a haplochromine fish cichlid of a satellite lake of Lake Victoria

Journal: Molecular Ecology

Volume: 13

Pages: 2589–2602

Short Title: Population-structure and genetic diversity in a haplochromine fish cichlid of a satellite lake of Lake Victoria

Legal Note: Kenya

Keywords: cichlid species flock, Lake Victoria, microsatellites, mitochondrial DNA haplotype network, population structure, satellite lake

Abstract: The approximately 500 species of the cichlid fish species flock of Lake Victoria, East Africa, have evolved in a record-setting 100 000 years and represent one of the largest adaptive radiations.

We examined the population structure of the endangered cichlid species *Xystichromis phytophagus* from Lake Kanyaboli, a satellite lake to Lake Victoria in the Kenyan Yala wetlands. Two sets of molecular markers were analysed — sequences of the mitochondrial control region as well as six microsatellite loci — and revealed surprisingly high levels of genetic variability in this species. Mitochondrial DNA sequences failed to detect population structuring among the three sample populations. A model-based population assignment test based on microsatellite data revealed that the three populations most probably aggregate into a larger panmictic population. However, values of population pairwise F_{ST} indicated moderate levels of genetic differentiation for one population. Eleven distinct mitochondrial haplotypes were found among 205 specimens of *X. phytophagus*, a relatively high number compared to the total number of 54 haplotypes that were recovered from hundreds of specimens of the entire cichlid species flock of Lake Victoria. Most of the *X. phytophagus* mitochondrial DNA haplotypes were absent from the main Lake Victoria, corroborating the putative importance of satellite lakes as refugia for haplochromine cichlids that went extinct from the main lake in the last decades and possibly during the Late Pleistocene desiccation of Lake Victoria.

Notes: 6206

'File' Attachments: internal-pdf://Abila-1695146496/Abila.pdf

Language: English

Reference Type: Journal Article

Record Number: 207

Author: M. V. Gupta

Year: 2002

Title: Genetic Enhancement and Conservation of Aquatic Biodiversity in Africa

Journal: NAGA

Volume: 25

Issue: 3-4

Pages: 48-53

Type of Article: Journal Article

Short Title: Genetic Enhancement and Conservation of Aquatic Biodiversity in Africa

Legal Note: Kenya

Abstract: There is a pressing need to enhance fish production in Africa through improved farm management and the use of improved fish breeds and/or alien species in aquaculture while at the same time conserve the aquatic genetic diversity. This paper presents the outcome of the Expert Consultation on Biosafety and Environmental Impact of Genetic Enhancement and Introduction of Improved Tilapia Strains/Alien Species in Africa held in Nairobi, Kenya on 20-23 February 2002. The main topics discussed were status of aquaculture in Africa and the role of genetic enhancement; potential benefits and risks involved in introduction of genetically improved strains and/or alien species with specific reference to tilapias; existing policies and legislation for the conservation of biodiversity, their strengths and weaknesses; capacity for undertaking genetic enhancement research and implementation of policies for the conservation of aquatic biodiversity.

Notes: 6207

'File' Attachments: internal-pdf://Gupta-2317445888/Gupta.pdf

Access Date: July-Dec 2002

Language: English

Reference Type: Conference Paper

Record Number: 208

Author: V. Bassen

Year: 2005

Title: Conservation efforts of the East African Whale Shark Trust in Kenya

Editor: T. Irvine and J. Keesing

Conference Name: The First International Whale Shark Conference Promoting International Collaboration in Whale Shark Conservation, Science and Management, Conference Overview, Abstracts and Supplementary Proceedings

Conference Location: 9-12 May 2005 Perth Western Australia

Pages: 20-23

Date: 2005

Pub Place: Kenya

Keywords: Kenya, whale shark, conservation

Abstract: While it is known that the highly migratory nature of whale sharks results in the world's largest fish being found in the waters of Kenya, minimal research has been conducted into their distribution and abundance along the Kenyan coast. The whale shark is listed on Appendix II of the Convention on International Trade in Endangered Species (CITES) and the Convention on Migratory Species (CMS), however the species is not protected by law in Kenya and whale sharks fishing remains unchecked. The East African Whale Shark Trust (EAWST) was established in 2005; it is a non-profit organisation concerned with the conservation and research of the whale shark. This paper describes what is presently known about whale sharks in Kenya and the goals of the EAWST.

Notes: 6208

URL: <http://www.srfme.com.au/documents/1stInterWhaleSharkconf.pdf>

'File' Attachments:

<internal-pdf://1stInterWhaleSharkconf-1695111168/1stInterWhaleSharkconf.pdf>

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 209

Author: P. Souter, O. Henriksson, N. Olsson and M. Grahn

Year: 2009

Title: Patterns of genetic structuring in the coral *Pocillopora damicornis* on reefs in East Africa

Journal: BMC Ecology

Issue: 9

Start Page: 19

Short Title: Patterns of genetic structuring in the coral *Pocillopora damicornis* on reefs in East Africa

Keywords: Population genetics, coral

Abstract: Background: Studies of population genetic structures provide an indication of direction and magnitude of larval transport and hence are an important component in the assessment of the ability of reefs to recover from severe disturbance. This paper reports data on population genetic structures in the coral *Pocillopora damicornis* from 26 reefs in Kenya and Tanzania.

Results: Gene flow among reefs was found to be variable, with a significant overall genetic subdivision ($F_{ST} = 0.023 \pm 0.004$ SE; $p < 0.001$), however, only 34% of all pairwise population comparisons showed significant differentiation. Panmixia could not be rejected between reefs separated by as much as 697 km, while other sites, separated by only a single kilometre, were found to be significantly differentiated. An analysis of molecular variance indicated that population genetic differentiation was significant only at the smaller spatial scale (< 10 km), whereas panmixia could not be rejected between groups of samples separated by over 100 km. Estimates of contemporary gene flow showed similar results, with numbers of first generation migrants within each population ranging from 0 to 4 (~5% of the total number of colonies sampled) and likely dispersal distances ranging between 5 and 500 km.

Conclusion: This study showed that population differentiation in *P. damicornis* varied over spatial scales and that this variability occurred at both evolutionary and ecological time scales. This paradox is discussed in light of stochastic recruitment and small scale population structures found in other species of coral. The study also identifies potential source reefs, such as those within Mnemba Conservation area near Zanzibar and genetically isolated reefs such as those within Malindi Marine National Park and Reserve in northern Kenya.

Notes: 6209

URL: <http://www.biomedcentral.com/content/pdf/1472-6785-9-19.pdf>

'File' Attachments: <internal-pdf://Souter-1256361472/Souter.pdf>

Reference Type: Journal Article

Record Number: 210

Author: M. Dorenbosch, B. J. A. Pollux, A. Z. Pustjens, S. Rajagopal, I. Nagelkerken, G. van der Velde and S. Y. Moon- van der Staay

Year: 2006

Title: Population structure of the Dory snapper, *Lutjanus fulviflamma*, in the western Indian Ocean revealed by means of AFLP fingerprinting

Journal: Hydrobiologia

Volume: 568

Issue: 1

Pages: 43-53

Date: 2006

Type of Article: Journal Article

Short Title: Population structure of the Dory snapper, *Lutjanus fulviflamma*, in the western Indian Ocean revealed by means of AFLP fingerprinting

Alternate Journal: Springer Netherlands

ISSN: 0018-8158.

Legal Note: Kenya

Keywords: AFLP

coral reef fish

dispersal

gene flow

genetic connectivity

Indian Ocean

Abstract: The genetic structure of spatially separated populations of the Dory snapper, *Lutjanus fulviflamma*, was investigated in seven areas along the East African coast and one area in the Comoros archipelago in the western Indian Ocean, using amplified fragment length polymorphism (AFLP). Phylogenetic and multidimensional scaling analyses did not show any clear clustering of individuals into the spatially separated populations. The analysis of molecular variance clearly showed that the variation was partitioned within populations and not between populations, leading to low genetic differentiation among populations. No clear relationship between genetic distance and geographic distance between populations was observed. These observations suggest that populations of *Lutjanus fulviflamma* have an open structure and are

possibly genetically connected on a large geographic scale in the western Indian Ocean.

Notes: 6210

URL: <http://www.springerlink.com/content/x153618v457v6767/>

'File' Attachments: [internal-pdf://Pollux\[1\]-0772083968/Pollux\[1\].pdf](internal-pdf://Pollux[1]-0772083968/Pollux[1].pdf)

Language: English

Reference Type: Conference Paper

Record Number: 211

Author: N. Okada, T. Sasaki, P. O. J. Bwathondi and B. P. Ngatunga

Year: 2007

Title: Population genetic analysis of Western Indian coelacanths based on mitochondrial DNA

Conference Name: Pioneering studies on coelacanth

Publisher: Pioneering studies on coelacanth

Volume: Part III

Pages: 45-47

Type: Proceedings Article

Pub Place: Kenya

Keywords: Coelacanth

population genetics

Western Indian Ocean

Abstract: In recent years, a large number of individuals of coelacanths have been landed off the coast of Tanzania. Although coelacanth specimens have also been landed at other localities in the western Indian Ocean, so far, viable populations of this species have been identified only at two localities, Comoros and South Africa. Therefore, the recent active catch of Tanzania suggests a new habitat for coelacanth. Based on the current situation surrounding the Tanzanian coelacanth, to examine the genetic background of the fish, we determined complete mitochondrial sequences of Tanzanian coelacanths collected from the north and south coasts of Tanzania. Using the criteria for six haplotypes established in a population genetic study for coelacanths living in the western Indian Ocean (Schartl et al., Nature 2005; 435:901), we analyzed mitochondrial haplotypes of Tanzanian coelacanths. As a result of haplotype characterization, we suggest that the southern specimen is a member of the Comoran group, but were swept away by the South Equatorial current. On the other hand, some of the northern specimens formed a haplotype group that contains Kenyan coelacanth. We assumed that the north Tanzanian specimens may be a member of an undiscovered population that exists near the boundary between Tanzania and Kenya.

Notes: 6211

URL: <http://www.marine.fks.ed.jp/japanese/coelacanth/image/p3-2.pdf>

'File' Attachments: [internal-pdf://p3-2\[1\]-1280579840/p3-2\[1\].pdf](internal-pdf://p3-2[1]-1280579840/p3-2[1].pdf)

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 212

Author: S. Fratini and M. Vannini

Year: 2002

Title: Genetic differentiation in the mud crab *Scylla serrata* (Decapoda: Portunidae) within the Indian Ocean

Journal: Journal of Experimental Marine Biology and Ecology

Volume: 272

Issue: 1

Pages: 103-116

Short Title: Genetic differentiation in the mud crab *Scylla serrata* (Decapoda: Portunidae) within the Indian Ocean

Legal Note: Kenya

Keywords: mtDNA variation; *Scylla serrata*; population genetic; Indian Ocean

Abstract: *Scylla serrata* (Decapoda: Portunidae) is a swimming crab that is widespread in the Indo-Pacific region and commonly found in estuarine and mangrove waters. An extended planktonic larval phase suggests high dispersal potential and the possibility of extensive gene flow between conspecific populations at least on a geographic mesoscale (tens to hundreds of kilometres).

Intraspecific variation of the mitochondrial DNA cytochrome oxidase subunit I (mtDNA COI) gene was investigated in 77 individuals from four representative mangrove swamps of the African tropics (Kenya and Zanzibar) by means of DNA sequencing. We examined 535 base pairs (bp) and identified 24 different haplotypes. Each population sample is characterised by a single most frequent haplotype, shared among all four populations, and a small number of rare ones, typically present in only one or two individuals and representative of a specific population. Analysis of molecular variance (AMOVA), F_{ST} statistics and χ^2 contingency analysis of spatial distribution of mtDNA haplotype frequencies revealed in toto a significant genetic differentiation among populations. These results could indicate that gene flow might be reduced, even between geographically close sites, despite the high potential for dispersal; anyway, at the recorded level of divergence and owing to the abundance of rare haplotypes and singletons in our data set, repeated sampling over time is necessary to establish whether the recorded pattern of genetic differentiation is stable and biologically significant. Finally, integration of our data with those reported by Gopurenko et al. [Mar. Biol. 134 (1999) 227] on *S. serrata* from South Africa, Red Sea and Mauritius Islands allowed to infer *S. serrata* population structure within a larger area of the Indian Ocean region.

Notes: 6212

'File' Attachments: internal-pdf://Fratini08-0661568513/Fratini08.pdf

Language: English

Reference Type: Journal Article

Record Number: 213

Author: J. S. Eklöf, S. Fröcklin, A. Lindvall, N. Stadlinger, A. Kimathi, J. N. Uku and T. R. McClanahan

Year: 2009

Title: How effective are MPAs? Predation control and 'spill-in effects' in seagrass–coral reef lagoons under contrasting fishery management

Journal: Marine Ecological Progressive Series

Volume: 384:

Pages: 83–96

Date: 2009

Type of Article: Journal Article

Short Title: How effective are MPAs? Predation control and 'spill-in effects' in seagrass–coral reef lagoons under contrasting fishery management

Legal Note: Kenya

Keywords: Marine protected areas • Indirect effects • Trophic cascades • Seagrass • *Tripneustes gratilla* • *Thalassodendron ciliatum* • Kenya • Shelter

Abstract: Marine protected areas (MPAs) are heavily promoted as a panacea for marine conservation, but lagging and sometimes idiosyncratic protection effects bring their overall effectiveness into question. In Kenyan lagoons, seagrass overgrazing by the sea urchin *Tripneustes gratilla* has been linked to removal of predators, but overgrazing has also been observed within well-protected MPAs. In this study we investigated the effectiveness of Kenyan MPAs in facilitating predation control over sea urchins, particularly *T. gratilla*, in relation to system (seagrass or coral reef), distance to reefs, and seagrass presence. A strong protection effect on urchin densities on reefs and a negative correlation between *T. gratilla* density and predation pressure (from sea stars, fish and gastropods) in seagrass beds ($r^2 = 0.345$) confirmed the importance of top-down control. Yet there were no clear effects of protection or distance to reefs in seagrass beds, most likely due to (1) low predator densities in the recently established Mombasa MPA; (2) 'spill-in' of aggregated *T. gratilla* into the older Watamu MPA (potentially facilitated by low predation pressure on the large urchins and nutrient enrichment); and (3) a potential buffering effect of seagrass canopies on predation, regardless of distance to reefs. Effects of seagrass presence differed between areas, but indicated that overgrazing in some areas could be self-regulated by inducing higher urchin mortality. As MPA effects appear to be system-, time- and site-specific, managers should also assess other more holistic approaches (e.g. banned fishing of urchin predators and reduced nutrient input from land runoff) to protect seagrasses.

Notes: 6213

URL: http://www.intres.com/articles/meps_oa/m384p083.pdf

'File' Attachments: <internal-pdf://Eklof-3876971008/Eklof.pdf>

Language: English

Reference Type: Journal Article

Record Number: 214

Author: T. R. McClanahan and N. A. Muthiga

Year: 1988

Title: Changes in Kenyan coral reef community structure and function due to exploitation

Journal: Hydrobiologia

Volume: 166

Issue: 3

Pages: 269-276

Type of Article: Journal Article

Short Title: Changes in Kenyan coral reef community structure and function due to exploitation
ISSN: 0018-8158.

Legal Note: Kenya

Keywords: coral reefs

Diadema

Echinometra mathaei

Kenya

overfishing

predation

sea urchins

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 (*E. mathaei*, *Diadema savignyi* and *D. setosum*) 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 monospecific barren of *E. mathaei* living outside burrows suggesting that *E. mathaei* 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. Data from the outer reef edge were more difficult to interpret but may indicate similar patterns. Within this area, physical stresses such as waves and currents may be a greater controlling force in regulating fishing activities and coral reef community structure.

Notes: 6214

URL: <http://www.springerlink.com/content/j3u3314861m04674/>

'File' Attachments: internal-pdf://McClanahan88-1-4027456256/McClanahan88-1.pdf

Language: English

Reference Type: Journal Article

Record Number: 215

Author: H. M. Alidina

Year: 2005

Title: Local Level Fisheries Management in Diani-Chale, Kenya: Current Status and Future Directions

Journal: Coastal Management

Volume: 33

Issue: 4

Pages: 459 - 470

Short Title: Local Level Fisheries Management in Diani-Chale, Kenya: Current Status and Future Directions

Legal Note: Kenya

Keywords: co-management; Diani-Chale; fisheries management; Kenya; local level management

Abstract: The current regime of fisheries management and the prospects for attaining a more locally oriented, collaborative system of fisheries management in Diani-Chale, Kenya are examined. At present fisheries management in Diani-Chale is characterized by diminished government capacity for regulation, weakened local institutions, and little ability to exert control over the use of fisheries. Local level management requires the development and use of local institutions that can govern the use of fishery resources. The fish landing sites used by fishers and their associated fishing grounds were identified to be at the appropriate level for resolving fishery management issues. A more formal role for these entities, the clarification of fishing ground tenure and access rights, and support for the development and enforcement of local fishing rules can further local management. The socioeconomic condition of fishers, their fear of losing landing sites, and the continued perception of the imposition of a marine reserve pose barriers to initiatives seeking to further local level management.

Notes: 6215

'File' Attachments: internal-pdf://Alidina2005[1]-3875745024/Alidina2005[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 216

Author: L. D. Rodwell, E. B. Barbier, C. M. Roberts and T. R. McClanahan

Year: 2003

Title: The importance of habitat quality for marine reserve – fishery linkages

Journal: Canadian Journal of Fisheries & Aquatic Science

Volume: 60

Issue: 2

Pages: 171–181

Date: 2003

Type of Article: Journal Article

Short Title: The importance of habitat quality for marine reserve – fishery linkages

Legal Note: Kenya

Keywords: Marine reserve, fish biomass, fish stock, productivity

Abstract: We model marine reserve – fishery linkages to evaluate the potential contribution of habitat-quality improvements inside a marine reserve to fish productivity and fishery catches. Data from Mombasa Marine National Park, Kenya, and the adjacent fishery are used. Marine reserves increase total fish biomass directly by providing refuge from exploitation and indirectly by improving fish habitat in the reserve. As natural mortality of the fish stock decreases in response to habitat enhancement in the reserve, catches increase by up to 2.6 tonnes (t)•km⁻²•year⁻¹ and total fish biomass by up to 36 t•km⁻². However, if habitat-quality improvement reduces the propensity of fish to move out of the reserve, catches may fall by up to 0.9 t•km⁻²•year⁻¹. Our results indicate that habitat protection in reserves can underpin fish productivity and, depending on its effects on fish movements, augment catches.

Notes: 6216

'File' Attachments: internal-pdf://Rodwell-1781220352/Rodwell.pdf

Language: English

Reference Type: Journal Article

Record Number: 217

Author: T. R. McClanahan, J. N. Uku and H. Machano

Year: 2002

Title: Effect of macroalgal reduction on coral-reef fish in the Watamu Marine National Park, Kenya

Journal: Marine and Freshwater Research

Volume: 53(2)

Pages: 223 - 231

Short Title: Effect of macroalgal reduction on coral-reef fish in the Watamu Marine National Park, Kenya

Legal Note: Kenya

Keywords: algae, herbivory, Kenya, phase shifts, marine protected areas, reef degradation

Abstract: The paper extends by five months the record of effects of reduction of leathery-macrophyte abundance in plots in a coral reef outcrop in the Watamu National Park, a site that had eliminated fishing for >20 years. After one year, leathery macrophytes had not recovered, but articulated green calcareous algae (*Halimeda*) had, and replaced leathery macrophytes as the dominant cover on the experimental plots. Of the 56 fish species studied, 20 were influenced by the algal reduction. There were increased numbers of individuals and species of herbivorous surgeonfish (4 species) and parrotfish (5 species), and increased population densities of invertebrate-eating fishes including angelfish (2 species), butterflyfish, emperors and snappers (not identified to species), wrasses (2 species), and a triggerfish. Negative effects were restricted to three damselfishes and one wrasse. Parrotfish, snappers and the total fish abundance showed a significant increase in size and biomass in the algal reduction plots over the year. No differences were found for macrophyte-feeding parrotfish (*Calotomus carolinus*). Increased herbivory was the likely cause of the slowness of the recovery of leathery macrophytes and the switch in dominance towards *Halimeda*.

Notes: 6217

'File' Attachments: internal-pdf://Mclanahan223-0941345024/Mclanahan223.pdf

Language: English

Reference Type: Journal Article

Record Number: 218

Author: T. R. McClanahan, C. C. Hicks and E. S. Darling

Year: 2008

Title: Response of the coral reef benthos and herbivory to fishery closure management and the 1998 ENSO disturbance

Journal: Oecologia

Volume: Volume 155

Issue: Number 1

Pages: 169-177

Short Title: Response of the coral reef benthos and herbivory to fishery closure management and the 1998 ENSO disturbance

Legal Note: Kenya

Keywords: Algae - Bleaching - Climate change - Indian Ocean - Marine protected areas - Succession

Abstract: The hypothesis that herbivory is higher in areas without fishing and will increase the rate at which hard coral communities return to pre-disturbance conditions was tested in and out of the marine protected areas (MPA) of Kenya after the 1998 El Niño Southern Oscillation (ENSO). Herbivory was estimated by assay and biomass methods, and both methods indicated higher herbivory in fishery closures. Despite higher herbivory, the effect of the ENSO disturbance was larger within these closures, with reefs undergoing a temporary transition from dominance by hard and soft coral to a temporary dominance of turf and erect algae that ended in the dominance of calcifying algae, massive Porites, Pocillopora and a few faviids six years after the disturbance. The fished reefs changed the least but had a greater cover of turf and erect algae and sponge shortly after the disturbance. Higher herbivory in the fishery closures reduced the abundance and persistence of herbivore-susceptible erect algae and created space and appropriate substratum for recruiting corals. Nonetheless, other post-settlement processes may have had strong influences such that annual rates of coral recovery were low (~ 2%) and not different between the management regimes. Recovery, as defined as and measured by the return to pre-disturbance coral cover and the dominant taxa, was slower in fishery closures than unmanaged reefs.

Notes: 6218

'File' Attachments: internal-pdf://Oecologia[1]-1932513025/Oecologia[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 219

Author: T. R. McClanahan and S. C. Mangi

Year: 2004

Title: Gear-based management of a tropical artisanal fishery based on species selectivity and capture size

Journal: Fisheries Management and Ecology

Volume: 11

Issue: 1

Pages: 51 - 60

Short Title: Gear-based management of a tropical artisanal fishery based on species selectivity and capture size

Legal Note: Kenya

Keywords: Artisanal fishing, coral reefs, gear selectivity, Kenya, multi-species fishery, nets, seagrass, traps

Abstract: The population density, species composition and lengths of fish landed by artisanal fishermen using six types of gear: large and small traps, gill nets, hand lines, spears and beach seines were studied in the multi-species fishery of southern Kenya. Selectivity and catch composition among gears were determined by studying the species richness, diversity, size and

mean trophic level of the catches for each gear type, to develop gear-based management recommendations for this artisanal reef lagoon fishery. One hundred and sixty-three reef and reef-associated species from 37 families were recorded in the catch. Beach seines and small traps accounted for the highest number of fish landed (34–35 individuals per fisherman per day). These gears also caught smaller fish than big traps, spears and gill nets. Beach seines caught the highest number of species (14 ± 7 species per day) while most other gears caught four to five species per day with no differences between gears. Predatory species with a mean trophic level of 3.6 dominated catches from hand lines, while the mean trophic level of the other gears was low and ranged from 2.6 to 2.9 with no differences between the gears. The high diversity and small size of fish caught in beach seines indicates that its selectivity overlapped most with large traps and gill nets. Spears and small traps also showed high similarity in species selectivity and small traps captured the smaller mean size of fish, indicating that they are likely to pre-empt the resource of spears. Large traps, hand lines and spears catch the largest individuals and the species composition of the catch differed sufficiently such that their selectivity should overlap the least and may, therefore, be the preferred mix of gears. The elimination or reduction of beach seines and small traps should reduce the catch of small fish and overlap in selectivity among the existing gears.

Notes: 6219

URL:

<http://www.aginternetwork.net/whalecomdownload.interscience.wiley.com/whalecom0/cgi-bin/fulltext/118796476/PDFSTART>

'File' Attachments: internal-pdf://McClanahan04-1457328896/McClanahan04.pdf

Language: English

Reference Type: Book Section

Record Number: 220

Author: T. R. McClanahan and D. O. Obura

Year: 1996

Title: Coral reefs and nearshore fisheries

Book Title: East African ecosystems and their conservation

Publisher: Oxford University Press

Short Title: Coral reefs and nearshore fisheries

Section: Kenya

Keywords: marine environment, coral reefs , coasts, ecosystems, nature conservation, fisheries, East Africa

Abstract: Although hard corals (Scleractinia) are found throughout the Earth's oceans, the calcium carbonate reefs formed by corals and algae, are generally restricted to tropical latitudes. Coral reefs are among the Earth's most productive ecosystems and near the theoretical limits of primary productivity. Coral reefs are also one of the Earth's oldest and enigmatic ecosystems. Some of the current knowledge of this ecosystem and the progress and problems associated with its management focusing on the coral reefs of East Africa, is discussed. Geography, biogeography, the food web and its diversity, production and ecological processes, human use of resources, shell collecting, fishing, patterns of species richness, and river discharges are reviewed. It is concluded that East African coral reefs are presently heavily used

by fishermen and tourists. They experience pollution and the negative effects of dynamite fishing.

Notes: 6220

'File' Attachments: internal-pdf://Obura[1]-2392376576/Obura[1].pdf

Author Address: Wildlife Conservation Society, Coral Reef Conservation Project, PO Box 99470, Mombasa, Kenya.

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 221

Author: T. R. McClanahan and S. Mangi

Year: 2001

Title: The effect of closed area and beach seine exclusion on coral reef fish catches.

Journal: Fisheries Management and Ecology

Volume: 8

Issue: 2

Pages: 107-121

Short Title: The effect of closed area and beach seine exclusion on coral reef fish catches.

Keywords: MPA, fishing, gears

Abstract: Fish landing data from adjacent the Mombasa Marine National Park (MNP) and seven sites in Diani, a legally gazetted but unprotected marine reserve, were studied over a four-year period to determine the influence of the park and of restrictions of beach seines on fisheries catches. Data were based on sampling for 3 to 12 days per month from 1995 to 1999, where fish were separated into the major families, the wet weights estimated by a spring balance, and data analysed based on gear, numbers of fishers, and the area from which the fish were caught. In the case of the Mombasa marine reserve, the beach seine exclusion was effected nearllysimultaneously with a reduction in the size of the Marine Protected Area. These two factors combined resulted in increased fish catches on a per area and fisher basis. It was, however, difficult to distinguish the effects of the two changes, but the initial pulse in catch is largely due to opening a previously un-fished area to fishing. In Diani the two landings that restricted beach seines for over 20 years had the highest per fisher catches, these being 13% greater than at sites with beach seines (ANOVA, $F = 4.5$). Catch data showed a progressive decline in per man catches in all the sites irrespective of the management in place or the exclusion of the beach seines. Nevertheless, the site next to the marine reserve had the highest catch per area (5.5 kg/ha) and slowest rate of decline despite having the highest number of fishers per area basis (0.07 ± 0.02 fishers/ha/month).

Notes: 6221

URL:

<http://www.aginternetwork.net/whalecomwww3.interscience.wiley.com/whalecom0/cgi-bin/fulltext/119028561/PDFSTART>

'File' Attachments: internal-pdf://McClanahan01-4241467648/McClanahan01.pdf

Language: English

Reference Type: Journal Article

Record Number: 222

Author: E. Mörk, G. L. Sjöo, N. Kautsky and T. R. McClanahan

Year: 2009

Title: Top-down and bottom-up regulation of macroalgal community structure on a Kenyan reef

Journal: Estuarine, Coastal and Shelf Science

Volume: 84

Issue: 3

Pages: 331-336

Start Page: Est. Coast. Shelf Sci.

Date: 2009

Type of Article: Journal Article

Short Title: Top-down and bottom-up regulation of macroalgal community structure on a Kenyan reef

Legal Note: Kenya

Keywords: macroalgae; grazing; nutrients; coral reefs; community composition; reef degradation; 4°1'22.73"S, 39°44'0.23"E

Abstract: Top-down and bottom-up regulation in the form of grazing by herbivores and nutrient availability are important factors governing macroalgal communities in the coral reef ecosystem. Today, anthropogenic activities, such as over-harvesting of herbivorous fish and sea urchins and increased nutrient loading, are altering the interaction of these two structuring forces. The present study was conducted in Kenya and investigates the relative importance of herbivory and nutrient loading on macroalgal community dynamics, by looking at alterations in macroalgal functional groups, species diversity (H') and biomass within experimental quadrats. The experiment was conducted in situ for 42 days during the dry season. Cages excluding large herbivorous fish and sea urchins were used in the study and nutrient addition was conducted using coated, slow-release fertilizer (nitrogen and phosphorous) at a site where herbivory is generally low and nutrient levels are relatively high for the region. Nutrient addition increased tissue nutrient content in the algae, and fertilized quadrats had 24% higher species diversity. Herbivore exclusion resulted in a 77% increase in algal biomass, mainly attributable to a >1000% increase in corticated forms. These results are in accordance with similar studies in other regions, but are unique in that they indicate that, even when prevailing nutrient levels are relatively high and herbivore pressure is relatively low, continued anthropogenic disturbance results in further ecological responses and increased reef degradation.

Notes: 6222

'File' Attachments:

internal-pdf://Mork%2520et%2520al.%25202009[1]-0740550401/Mork%2520et%2520al.%25202009[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 223

Author: T. Sasaki, T. Sato, S. Miura, P. O. J. Bwathondi, B. P. Ngatunga and N. Okada

Year: 2007

Title: Mitogenomic analysis for coelacanths (*Latimeria chalumnae*) caught in Tanzania

Journal: Gene

Volume: 389

Issue: 1

Pages: 73-79

Short Title: Mitogenomic analysis for coelacanths (*Latimeria chalumnae*) caught in Tanzania

Legal Note: Kenya

Keywords: Haplotype; Living fossil; Population; Western Indian Ocean Fisheries, small-scale fisheries, fisheries management, biodiversity

Abstract: In recent years, a large number of individuals of the species *Latimeria chalumnae*, one of the living fossil coelacanths, have been landed off the coast of Tanzania. Although *L. chalumnae* specimens have also been landed at other localities in the western Indian Ocean, so far, viable populations of this species have been identified only at two localities, Comoros and South Africa. Therefore, the recent active catch off Tanzania suggests a new habitat for *L. chalumnae*. To examine the genetic background of the Tanzanian fish, we analyzed complete mtDNA sequences of two Tanzanian individuals (Kigombe-9 and Songo Mnara-1) collected from the north and south coasts of Tanzania. Using the recently reported criteria for six haplotypes established in a population genetic study for coelacanths living in the western Indian Ocean [Schartl, M., Hornung, U., Hissman, K., Schauer, J., Fricke, H., 2005. Relatedness among east African coelacanths. *Nature* 435, 901.], we characterized Songo Mnara-1 as haplotype 1 and Kigombe-9 as haplotype 5. We suggest that the Songo Mnara specimen is a member of the Comoran group, but was swept away by the South Equatorial current. The individual from Kigombe may be a member of an undiscovered population that exists near the boundary between Tanzania and Kenya. Further analysis using more than 19 individuals recently captured off the north coast of Tanzania will reveal whether a new population exists there. Our sequence data suggest additional variable sites in the mtDNA sequence that may define the population structure of coelacanths in the western Indian Ocean and also raise the possibility that the previously published Comoran coelacanth mtDNA sequence contains several critical errors including base changes and indels.

Notes: 6223

Author Address: Department of Evolutionary Biology and Biodiversity, National Institute for Basic Biology, 38 Nishigonaka, Myodaiji, Okazaki, 444-8585, Japan.

Language: English

Reference Type: Journal Article

Record Number: 224

Author: M. N. Bruton and S. E. Coutouvidis

Year: 1991

Title: An inventory of all known specimens of the coelacanth *Latimeria chalumnae*, with comments on trends in the catches

Journal: Environmental Biology of Fishes

Volume: 32

Issue: 1-4

Pages: 371-390

Date: 1991

Type of Article: Journal Article

Short Title: An inventory of all known specimens of the coelacanth *Latimeria chalumnae*, with comments on trends in the catches

Legal Note: Kenya

Keywords: Fish distribution, Comoros, Fishery, Longlining, Museums, - Curation

Abstract: A list is presented of all known specimens of the coelacanth *Latimeria chalumnae* based on a survey of the literature and of museum, aquarium and university holdings. Details are given of the date, place, time and depth of capture, the name and age of the fisherman, the length, weight and sex of the fish, the first literature record, the method of preservation and the present location of specimens, if known. A new number is assigned to each specimen. At least 172 coelacanths are known to have been caught since 1938. The first coelacanth was caught off South Africa but all properly documented, subsequent specimens have been caught off the islands of Grand Comoro and Anjouan in the Comoros. An appeal is made to the Comoran authorities for each specimen that is caught to be made available for scientific study. Museum authorities are also encouraged to allow their specimens to be X-rayed or dissected so that vital information can be obtained on fecundity, foetal nutrition and dietary preferences. It is essential for the coelacanth conservation effort that this inventory is maintained by the Coelacanth Conservation Council.

Notes: 6224

'File' Attachments: internal-pdf://Bruton371-1686125312/Bruton371.pdf

Language: English

Reference Type: Journal Article

Record Number: 225

Author: M. N. Bruton, S. E. Coutouvidis and J. Pote

Year: 1991

Title: Bibliography of the living coelacanth *Latimeria chalumnae*, with comments on publication trends

Journal: Environmental Biology of Fishes

Volume: 32

Issue: 1-4

Pages: 403-433

Short Title: Bibliography of the living coelacanth *Latimeria chalumnae*, with comments on publication trends

Legal Note: Kenya

Keywords: Ichthyology, Literature, Publication trends, Comoros

Abstract: A list of published references on the coelacanth *Latimeria chalumnae* is provided. All known publications in the scientific literature are included as well as popular articles and press reports that are considered to provide new information or interpretations. Marked trends are noticeable in the literature as different disciplines have been applied to research on the coelacanth over the past five decades. The bibliography lists a total of 823 publications including 490 papers in journals, 37 books, 3 theses, 45 chapters in books, 166 popular articles,

22 reports and 60 newspaper articles. Studies on taxonomy and morphology initially dominated the literature followed by reports on research in the fields of physiology, behaviour, breeding biology, ecology and conservation as frozen and eventually live specimens became available for study. The literature on the living coelacanth is predominantly in English, French, Japanese and German but references in 12 other languages were also traced. The dominant authors in the first decades of coelacanth research were the French scientists J. Millot and J. Anthony and the South African describer of the first and second coelacanths, J.L.B. Smith. In subsequent years French, British, American, South African, Japanese, Canadian and German authors, among others, have made significant contributions.

Notes: 6225

'File' Attachments: <internal-pdf://Bruton403-2323625216/Bruton403.pdf>

Language: English

Reference Type: Journal Article

Record Number: 226

Author: A. J. Ribbinka and M. Roberts

Year: 2006

Title: African Coelacanth Ecosystem Programme: An overview of the conference contributions

Journal: South African Journal of Science

Volume: 102

Pages: 409-415

Short Title: African Coelacanth Ecosystem Programme: An overview of the conference contributions

Legal Note: Kenya

Abstract: Latimeria chalumnae is the icon for the multidisciplinary, multinational African Coelacanth Ecosystem Programme (ACEP) dedicated to improving the understanding of biological and other processes that support marine life. This article provides an overview of contributions made at a conference hosted by ACEP at the end of 2003. It also reviews significant developments regarding coelacanth conservation which have taken place since the conference. Delegates at the meeting concluded that the integrated regional, ecosystem approach that had been adopted by ACEP should continue. Underwater observation and exploration, however, should be supplemented by more experimental and technical analyses in order to answer longstanding questions related to coelacanths and other organisms.

Notes: 6226

Language: English

Reference Type: Journal Article

Record Number: 227

Author: N. Nyandwi

Year: 2009

Title: Protection of The Coelacanth, a Primitive Fish in The Coastal Waters of Tanzania

Journal: Ocean & Coastal Management

Volume: 52

Issue: 12

Pages: 655-659

Short Title: Protection of The Coelacanth, a Primitive Fish in The Coastal Waters of Tanzania

Legal Note: Kenya

Keywords: Coelacanth; Oceanographic conditions; Protection options; Socio-economic impacts

Abstract: Since the first coelacanth (*Latimeria chalumnae*) capture in Tanzania in 2003 there have been about 35 other captures. With increasing call for protection, imposing ban on gill net fishery, which has resulted in the accidental captures is being considered off Kigombe, northern Tanzania. There is however, a dilemma because the gill net fishery is just recent, having been introduced towards attaining poverty eradication and food security goals. On the basis of the assessment of the environmental conditions of the coelacanth it is suggested that a total ban on bottom set shark nets may not be necessary except during the cooler SE monsoon period when coelacanth can easily venture into the cool shallow waters in search for food.

Notes: 6227

'File' Attachments: <internal-pdf://Nyandwi09-1051860736/Nyandwi09.pdf>

Language: English

Reference Type: Journal Article

Record Number: 228

Author: M. Schartl, U. Hornung, K. Hissmann, J. Schauer and H. Fricke

Year: 2005

Title: Genetics: Relatedness among east African coelacanths

Journal: Nature

Volume: 435

Start Page: 901

Short Title: Genetics: Relatedness among east African coelacanths

Legal Note: Kenya

Keywords: Coelacanth, genetic variation, metapopulation

Abstract: Coelacanths were discovered in the Comoros archipelago to the northwest of Madagascar in 1952. Since then, these rare, ancient fish have been found to the south off Mozambique, Madagascar and South Africa, and to the north off Kenya and Tanzania — but it was unclear whether these are separate populations or even subspecies. Here we show that the genetic variation between individuals from these different locations is unexpectedly low. Combined with earlier results from submersible and oceanographic observations, our findings indicate that a separate African metapopulation is unlikely to have existed and that locations distant from the Comoros were probably inhabited relatively recently by either dead-end drifters or founders that originated in the Comoros.

Notes: 6228

'File' Attachments: [internal-pdf://Schart\[1\]-2585600000/Schart\[1\].pdf](internal-pdf://Schart[1]-2585600000/Schart[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 229

Author: R. E. Stobbs and M. N. Bruton

Year: 1991

Title: The fishery of the Comoros, with comments on its possible impact on coelacanth survival

Journal: Environmental Biology of Fishes

Volume: 32

Issue: 1-4

Pages: 341-359

Type of Article: Journal Article

Short Title: The fishery of the Comoros, with comments on its possible impact on coelacanth survival

Legal Note: Kenya

Keywords: Artisanal fishing, Canoes, Conservation, Fishing methods, Ruvettus

Abstract: The traditional methods of deepsea handline fishing in the Comoros are described. The main target species is the oilfish *Ruvettus pretiosus*, and the coelacanth *Latimeria chalumnae* is caught as a bycatch. In recent years motorised dugout canoes as well as outboard- and inboard-powered boats have been introduced into the fishery, and more efficient fishing tackle has become available. The more modern gear is intended for use on pelagic fishes and has added a new dimension to the fishery. Traditional handline fishermen are not considered to be a threat to the coelacanth, but the fishermen equipped with motorised boats and modern tackle would constitute a real threat if they direct their efforts on inshore reefs.

Notes: 6229

'File' Attachments: <internal-pdf://stobbs-1902041345/stobbs.pdf>

Language: English

Reference Type: Journal Article

Record Number: 230

Author: L. DeVos and D. Oyugi

Year: 2002

Title: First capture of a coelacanth, *Latimeria chalumnae* Smith, 1939 (Pisces : Latimeriidae), off Kenya

Journal: South African Journal of Science

Volume: 98

Issue: 7-8

Pages: 345–347.

Type of Article: Journal Article

Short Title: First capture of a coelacanth, *Latimeria chalumnae* Smith, 1939 (Pisces : Latimeriidae), off Kenya

Legal Note: Kenya

Abstract: On Thursday 26 April 2001, around noon, Captain Suleiman Fahli of the trawler MV Venture II, owned by Basta Allessandro, hauled in a large female coelacanth (*Latimeria chalumnae*) from the western Indian Ocean off Malindi, Kenya. The fish was caught in a trawl net of 2-inch (50 mm) mesh size that was targeting deep-water prawns. The exact site of capture was 7 nautical miles (about 13 km) offshore (03 deg 14 min, S, 40 deg 14 min E) at a depth of 185 m. According to Fahli, the fish was very active at the time of capture and bluish in colour. The fishermen wisely decided to keep the specimen because of its uniqueness. It was

stored at about -18 deg C in a deepfreeze at Wanainchi Marine Products, a fish processing company, inMombasa. The details of the capture of this first (authenticated) record were obtained from Captain Fahli through the intervention of Charles Oduol (Area Director of Fisheries, coastal region). The latter was informed about the catch by Hakim Tung of Wanainchi Marine Products. After a few weeks, Tung removed some red muscle and a few scales from the fish and sent them in absolute alcohol to the Jago team at the Max Planck Institute of Seewiesen, Germany, for comparison with Latimeria samples from other localities.

Notes: 6230

Language: ENGLISH

Reference Type: Report

Record Number: 232

Author: G. M. Wamukoya, W. K. Ottichilo and R. V. Salm

Year: 1997

Title: Survey of dugongs (dugong dugon) in Ungwana Bay and the Lamu Archipelago, Kenya

Institution: Kenya Wildlife Service

Type: Technical Series Report

Short Title: Survey of dugongs (dugong dugon) in Ungwana Bay and the Lamu Archipelago, Kenya

Notes: 6232

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 233

Author: F. Pertet and J. W. Thorsell

Year: 1980

Title: The Dugong in Kenya

Institution: Kenya Wildlife Service

Publisher: K. W. S. P. Unit

Short Title: The Dugong in Kenya

Notes: 6233

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 234

Author: P. J. Jarman

Year: 1966

Title: THE STATUS OF THE DUGONG (DUGONG DUGON MOLLER); KENYA, 1961

Journal: African Journal of Ecology

Volume: 4

Issue: 1

Pages: 82 - 88

Date: 1966

Type of Article: Journal Article

Short Title: THE STATUS OF THE DUGONG (DUGONG DUGON MOLLER); KENYA, 1961

Legal Note: Kenya

Abstract: The scarcity of dugong (*Dugong dugon* Miiller) throughout their former range and lack of knowledge of the species' ecology justifies this record of the opinions of the fishermen in the Lamu district of Kenya, where the species is still plentiful. The area and the programme of questioning are described. The social life, reproduction, movements and predators of the dugong are recorded as reported by the fishermen. The present distribution is contrasted with the past. My observations on the food plants and their distribution are given, as well as the fishermen's estimation of the part each plays in the dugong's diet. The need for calm water over feeding grounds, afforded by depth of water or shelter from winds, seems to be a controlling factor in the distribution of dugong. Man appears to be the main predator.

Notes: 6234

'File' Attachments: internal-pdf://Esther_Dugong[1]-3000828160/Esther_Dugong[1].pdf

Language: English

Reference Type: Report

Record Number: 235

Author: M. Mohammed, R. Alderson and R. Williams

Year: 2002

Title: Report on dugong research trips to Siyu Channel and Kiunga Muini areas, Kenya. April–May 2002

Short Title: Report on dugong research trips to Siyu Channel and Kiunga Muini areas, Kenya. April–May 2002

Notes: 6235

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article

Record Number: 236

Author: V. G. Cockcroft

Year: 1955

Title: Aerial survey in Kenya finds few dugongs

Place Published: Sirenews

Publisher: IUCN/SSC Sirenia Specialist Group

Type of Article: Newsletter

Short Title: Aerial survey in Kenya finds few dugongs

Notes: 6236

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 237

Author: S. Sharlow
Year: 1996
Title: Kenya Wildlife Service Turtle and Dugong project
Institution: Kenya Wildlife Service
Publisher: K. W. Service
Type: report
Short Title: Kenya Wildlife Service Turtle and Dugong project
Notes: 6237
Last Modified Date: Emmanuel Mbaru
Language: English

Reference Type: Magazine Article
Record Number: 238
Author: S. Ligon
Year: 1982
Title: Aerial survey of the dugong, Dugong dugon in Kenya
Magazine: Newsletter Article
Short Title: Aerial survey of the dugong, Dugong dugon in Kenya
Notes: 6238
Last Modified Date: Veronica Wanjeri
Language: English

Reference Type: Report
Record Number: 239
Author: G. M. Wamukoya, J. R. Mbendo and C. V. C. A. Preen
Year: 1996
Title: Indigenous knowledge and Community Participation in Dugong Conservation in Kenya
Pages: 13
Type: Unpublished report
Short Title: Indigenous knowledge and Community Participation in Dugong Conservation in Kenya
Notes: 6239
Last Modified Date: veronica wanjeri
Language: English

Reference Type: Report
Record Number: 240
Author: J. A. Ochilo
Year: 1986
Title: Sea Cow (Dugong Dugon) Survey along the Kenya Coast
Institution: Resource Survey and Management Department research
Pages: 5
Short Title: Sea Cow (Dugong Dugon) Survey along the Kenya Coast
Notes: 6240

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 242

Author: B. Fulanda, C. Munga, J. Ohtomi, M. Osore, R. Mugo and M. Y. Hossain

Year: 2009

Title: The structure and evolution of the coastal migrant fishery of Kenya

Journal: Ocean & Coastal Management

Volume: 52

Issue: 9

Pages: 459-466

Date: 2009

Type of Article: Journal Article

Short Title: The structure and evolution of the coastal migrant fishery of Kenya

DOI: doi:10.1016/j.ocecoaman.2009.07.001

Legal Note: Kenya

Keywords: Age

Beaches

Coastal fisheries

Coastal zone management

Fishery management

Fishing gear

Fishing vessels

Marine resources

Abstract: The current study was carried out over a period of one year to characterise the coastal migrant fishery of Kenya. The study looked at gears and vessels used, and ownership, demographic factors including ages of the fishers and family sizes, migrant activity and resource conservation at two main fishing villages in Kenya; Vanga and Mayungu in the south and north coasts, straddling at 4.663°S and 39.215°E and 3.214°S and 40.135°E respectively. Further, the fishers were categorised with regard to fishing, gear and vessel operation and trade, and evolution upon entry into the fishery was also assessed in order to define fisher-stake in the fishery for resource management and conservation planning. Structured questionnaires were used to interview the fishers, and data and information recorded from 1018 fishers during the survey. Migrants accounted for over 63% of the fishers in the two study sites, with majority of the fishers lying in the 15–45 year age bracket. Dependence level averages at 4–6 person families per fisher. Entry to the fishery was mainly at seamen level, progressing to fishermen and finally to fish dealers (tajiris), with the latter holding >62% capital in the fishery. Resource management in the fishery was low and only 10% of the fishers were active participants in marine conservation and community beach management issues. Fisher migrations were mainly monsoon season-linked (>58%) although social factors such as family location determined to a great extent the expanse of the migrations. The revival of fisheries cooperatives and active participation in community resource management and conservation groups is envisaged as the key to the sustainability of both the marine resources and the economies associated with this

high mobility, cross-border fishery

Notes: 6242

'File' Attachments: internal-pdf://Osore09-1833602560/Osore09.pdf

Author Address: Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa 80100, Kenya

Language: English

Reference Type: Report

Record Number: 243

Author: E. C. Kamau, A. Wamukota and N. Muthiga

Year: 2005

Title: Promotion and Management of Marine Fisheries in Kenya

Series Title: Specific Targeted Research Project Report

Publisher: INCOFISH

Short Title: Promotion and Management of Marine Fisheries in Kenya

Keywords: Kenya coast, fishing, fishery production, management

Abstract: With an estimated 500 km long coastline and variety of marine and wetland habitats, the marine sub-sector is host to nearly 12,000 fishers, out of which 95% are artisanal. Fishing is carried out in the near shore areas using simple boats and is heavily dependant on the monsoon wind patterns. The annual catch has fluctuated between 4,000 and 10,000 MT for the last 20 years with some areas reporting overfishing. While sport fishing and aquaculture are also important economic activities on the Kenyan coast, the offshore fisheries zone, which is believed to contain vast and valuable stocks of fishery resources, is exploited by vessels from Distant Water Fishing Nations. Apart from fishing, the Kenyan coastal zone hosts a multiplicity of other demands ranging from agriculture to tourism, shipping and ports, marine dredging, offshore oil exploration, curio trade, mining and fossil coral extraction and mangrove harvesting. All these demands on the coastal zone have led to, inter alia, declining fishery production, habitat destruction, resource use conflicts and a decline in biodiversity. Resource-overuse, tourism, prawn trawling and salt production firms have been blamed for the decline in fish catches. There is a lack of enforcement capacity necessary to mitigate the decline in fish catches caused by overfishing and use of destructive gear. Against this backdrop, the encouragement of responsible fishing practices and co-management structures, curtailment of destructive fishing methods, and the development of Marine Protected Areas have been suggested. Nonetheless, the incorporation of traditional fisheries management with formal regime through the Beach Management Unit (BMU) is seen as a lasting solution. In recognition of the fundamental pre-requisite for fishery development, the Fisheries Department's draft policy provides for better coordination between fishery management and research. The policy too has an important reform agenda, although the cost of implementation is colossal. Nevertheless, better collaboration between stakeholders is expected to strengthen the synergies and make management more effective.

Notes: 6242

'File' Attachments: internal-pdf://EC Kamau-0097248512/EC Kamau.pdf

Last Modified Date: Veronica wanjeri

Language: English

Reference Type: Journal Article

Record Number: 244

Author: M. Matlock

Year: 2008

Title: East Africa and coastal and marine environment

Journal: UNEP

Type of Article: United Nations Environment Programme; 2008. "Eastern Africa and coastal and marine environments." In: Encyclopedia of Earth. Eds. Cutler J. Cleveland (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment).

Short Title: East Africa and coastal and marine environment

Legal Note: Kenya

Keywords: Biodiveristy, tourism, fishery, climate change

Abstract: The main concerns are the loss of biodiversity, habitat degradation and the modification of mangrove and coral reef ecosystems. Human-related pressures come from overfishing and fishing-related damage, from urbanization and tourism development, from agriculture and industry, and from damming for hydropower. Other important concerns are the reported dumping of hazardous wastes on Somalia's shores and coastal waters and climate change, contributing to coral bleaching and sea-level rise, which in turn leads to coastal erosion and inundation of coastal lowlands. Another issue is the sporadic infestation of coral reefs by the invasive crown-of-thorns starfish (COTS). The shores facing the Indian Ocean were impacted by the catastrophic tsunami of 26 December 2004, and in Somalia, some 300 people are reported to have died.

Notes: 6244

Language: English

Reference Type: Book

Record Number: 245

Author: D. O. Obura, J. Tanelander and O. E. Linden

Year: 2008

Title: Ten Years after bleaching – facing the consequences of climate change in the Indian Ocean. Cordio Status Report 2008.

Series Editor: D. T. Obura, J Linden, O (Ed)

Series Title: Ten Years after bleaching – facing the consequences of climate change in the Indian Ocean. Cordio Status Report 2008. CORDIO (Coastal Oceans Research and Development in the Indian Ocean)/Sida-Sarec. Mombasa

Publisher: Leiden University

Short Title: Ten Years after bleaching – facing the consequences of climate change in the Indian Ocean. Cordio Status Report 2008.

Notes: 6245

'File' Attachments:

internal-pdf://cordio_status_report_part_2[1]-1527258881/cordio_status_report_part_2[1].pdf

Language: English

Reference Type: Report

Record Number: 246

Author: J. Ochiwo

Year: 2006

Title: Harvesting and Sustainability of Marine Fisheries in Malindi-Ungwana Bay, Northern Kenya Coast

Series Title: WIOMSA/MARG-I/2006-03.

Pages: 43

Publisher: WIOMSA

Date: 2006

Type: MARG Report

Short Title: Harvesting and Sustainability of Marine Fisheries in Malindi-Ungwana Bay, Northern Kenya Coast

Keywords: Malindi, Ungwana Bat, fishing, prawn

Abstract: This is a socio-economic study conducted at two main fishing villages (Ngomeni and Kipini) and Malindi Municipality along the Malindi-Ungwana in the northern Kenya coast. It aims at investigating the factors that influence the sustainability of fish harvesting in the Kenyan Malindi-Ungwana bay. Specifically the study addresses three objectives namely to: (1) investigate the factors that influence fish harvesting and sustainability, (2) estimate the maximum sustainable yield (MSY) of the penaeid prawn fishery and (3) suggest policy measures that would enhance optimal utilisation of the fishery. Both secondary and primary data were collected during the study. Primary data were collected using a combination of socioeconomic data collection techniques namely observation, key-informant interviews, semi-structured interviews, and surveys. Both descriptive and regression analyses have been undertaken using both SPSS and Stata, econometric software, to establish the causal relationships in the fishery. The maximum sustainable yield (MSY) in the prawn fishery has been estimated using the estimation procedure suggested by FAO (1992).

Notes: 6246

'File' Attachments: internal-pdf://Ochiwo[1]-1939026181/Ochiwo[1].pdf

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 247

Author: J. F. C. Morgans

Year: 1962

Title: Ecological Aspects of Demersal Tropical Fishes off East Africa

Journal: Nature

Volume: 193

Pages: 86-87

Type of Article: Journal Article

Short Title: Ecological Aspects of Demersal Tropical Fishes off East Africa

Legal Note: Kenya

Keywords: North Kenya Bank, fish

Abstract: COMPARATIVELY little is known of the ecology of warm-water tropical fisheries and there is, in particular, no body of general knowledge about the demersal fishes except, perhaps, for those in and about coral reefs. Now that a preliminary survey of the bottom fishes of the North Kenya Banks has been completed, a number of facts have come to light that are likely to be of general interest

Notes: 6247

Language: English

Reference Type: Journal Article

Record Number: 250

Author: A. R. Kaliba, C. C. Ngugi, J. M. Mackambo, K. O. Osewe, E. Senkondo, B. V. Mnembuka and S. Amisah

Year: 2007

Title: Potential effect of aquaculture promotion on poverty reduction in Sub-Saharan Africa

Journal: Aquaculture International

Volume: 15

Issue: 6

Pages: 445-459

Epub Date: Tuesday, July 24, 2007

Date: 2007

Type of Article: Journal Article

Short Title: Aquacult. Int.

ISSN: 0967-6120 (Print) 1573-143X (Online)

DOI: 10.1007/s10499-007-9110-5

Legal Note: Kenya

Keywords: Aquaculture

CGE

Economic effects

Poverty reduction

Abstract: There is a policy of increased support of aquaculture development in Sub-Saharan Africa. In the region, aquaculture expansion has the potential to create new jobs and improve food security among poor households. Three computable general equilibrium models were used to estimate the effects of aquaculture expansion and increased input productivity on poverty reduction in Ghana, Kenya, and Tanzania. The results suggest that there will be positive effects on per capita income for all households in Ghana and Kenya. In Tanzania some rich households will experience income loss, because of resource shift from other sectors to aquaculture. Because of reduction in poverty associated with price reductions, and increases in minimum income associated with income expansion, the poverty gap decreased in all household groups. Because of high sectoral linkages, aquaculture development is a potential candidate for sector-specific policy support to address poverty reduction in Sub-Saharan Africa.

Notes: 6250

'File' Attachments: internal-pdf://Kaliba[1]-1814952704/Kaliba[1].pdf

Author Address: Department of Economics & Finance, Southern University and A & M College,

Baton Rouge, LA 70813, USA

Language: English

Reference Type: Book Section

Record Number: 251

Author: I. Neira, C. R. Engle and C. Ngugi

Year: 2005

Title: Economic and risk analysis of tilapia production in Kenya

Editor: C. F. J. Burright, and H. Egna (Editors),

Book Title: Twenty-Second Annual Technical Report. Aquaculture CRSP, Oregon State University, Corvallis, Oregon,

Pages: 8

Series Editor: O. S. University

Short Title: Economic and risk analysis of tilapia production in Kenya

Section: Kenya

Keywords: Fish farming, Kenya, Tilapia

Abstract: Fish farming in Kenya has potential to further develop commercial production of tilapia. Further growth and development of the tilapia industry in Kenya will depend upon its profitability and the effect of associated risks. Data from pond experiments, on-farm trials, and farm surveys were used to develop enterprise budgets and a risk analysis for two mixed-sex tilapia monoculture production scenarios: 1) stocking tilapia at 2/m² fed with rice bran; and 2) stocking tilapia at 3/ m² fed with a pelleted diet. Net returns/ha were highest for the farms feeding pellets while lower net returns/ha were obtained by the rice-bran fed alternative. Profitability was affected by feed cost, survival, and farm size. The lower yields from the rice-bran feed scenario resulted in its greater sensitivity to fluctuating survival and costs.

Notes: 6251

Last Modified Date: Veronica wanjeri

Language: English

Reference Type: Journal Article

Record Number: 252

Author: S. Dadzie

Year: 1992

Title: An overview of aquaculture in eastern Africa,

Journal: Hydrobiologia

Volume: 232

Issue: 1

Pages: 99-110

Type of Article: Proceedings Article

Short Title: An overview of aquaculture in eastern Africa,

Legal Note: Kenya

Keywords: Aquaculture, Tilapia, Eastern Africa

Abstract: Egypt, Kenya and Malawi, have the earliest recorded history of fish farming in eastern Africa, dating back to the beginning of the century. Between 1940 and 1960 aquaculture started

in Rwanda, Uganda, Zambia, Zimbabwe and Tanzania in that order. Overall, Egypt is the leader in aquaculture development in the region with an estimated annual production of 24000t (1982), followed by Zambia, 1680t (1967), then Kenya, 1085t (1985). The main aquaculture systems in practice are: monoculture, polyculture, using tilapia as the main species, mono- or polyculture of tilapia with animal husbandry and rice-cum-fish culture. Aquaculture research and training are carried out in universities, research institutions and Government Fisheries Training colleges. The major common constraints to aquaculture development are biological, infrastructural and economic.

Notes: 6252

Language: English

Reference Type: Journal Article

Record Number: 253

Author: L. W. Botsford, J. C. Castilla and C. H. Peterson

Year: 1997

Title: The Management of Fisheries and Marine Ecosystems

Journal: Science

Volume: 277

Issue: 5325

Pages: 509 - 515

Date: 1997

Type of Article: Journal Article

Short Title: The Management of Fisheries and Marine Ecosystems

Legal Note: kenya

Keywords: Marine ecosystems, fisheries, overfishing

Abstract: The global marine fish catch is approaching its upper limit. The number of overfished populations, as well as the indirect effects of fisheries on marine ecosystems, indicate that management has failed to achieve a principal goal, sustainability. This failure is primarily due to continually increasing harvest rates in response to incessant sociopolitical pressure for greater harvests and the intrinsic uncertainty in predicting the harvest that will cause population collapse. A more holistic approach incorporating interspecific interactions and physical environmental influences would contribute to greater sustainability by reducing the uncertainty in predictions. However, transforming the management process to reduce the influence of pressure for greater harvest holds more immediate promise.

Notes: 6253

'File' Attachments: internal-pdf://Botsford[1]-2886021120/Botsford[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 254

Author: R. Goñi

Year: 1998

Title: Ecosystem effects of marine fisheries: an overview

Journal: Ocean & Coastal Management

Volume: 40

Issue: 1

Pages: 37-64

Date: 1998

Type of Article: Journal Article

Short Title: Ecosystem effects of marine fisheries: an overview

Legal Note: Kenya

Keywords: Marine ecosystems, fishing impacts

Abstract: Most fisheries literature avoids speaking about ecosystem impacts of fishing, either because impacts are not demonstrated or because a causal relationship between impacts and fishing cannot be formally established with the available information. However, there is mounting evidence that fishing has undesired effects in the marine ecosystems. This overview examines the wide ecosystem effects of fishing, describing and illustrating the potential unintended effects of the main fisheries of the world. An operational framework for classifying the effects of fishing in terms of the mechanisms generating the effects is provided. The focus and, to a large extent, the recourse to examples is on those fisheries for which the impacts of fishing have been best studied such as those in the North Atlantic and the Northeast Pacific. Ecosystem effects are divided into direct and indirect: direct effects include the fishing mortality exerted on target populations (overfishing), the fishing mortality sustained by non-target populations (bycatch), and the physical impacts caused by towed gears on benthic organisms and on the seabed. Indirect effects include impacts mediated by biological interactions, the environmental effects of dumping discards and organic detritus (offal), and the mortality caused by lost gear (ghost fishing).

Notes: 6254

'File' Attachments: internal-pdf://Goni98-2695789056/Goni98.pdf

Language: English

Reference Type: Journal Article

Record Number: 255

Author: T. R. McClanahan and S. H. Shafir

Year: 1990

Title: Causes and consequences of sea urchin abundance and diversity in Kenyan coral reef lagoons

Journal: Oecologia

Volume: 83

Issue: 3

Pages: 362-370

Type of Article: Journal Article

Short Title: Causes and consequences of sea urchin abundance and diversity in Kenyan coral reef lagoons

Legal Note: Kenya

Keywords: Community structure - Coral reefs - Predation - Sea urchins - Triggerfish

Abstract: Large differences in community structure of sea urchins and finfish have been observed in Kenyan reef lagoons. Differences have been attributed to removal of finfish

predators through human fishing activities. This study attempted to determine (i) the major sea urchin finfish predators, (ii) the effect of predation on sea-urchin community structure, and (iii) the possible effect of sea urchin increases and finfish decreases on the lagoonal substrate. Six reefs, two protected and four unprotected, were compared for differences in finfish abundance, sea urchin abundance and diversity and substrate cover, diversity and complexity. Comparisons between protected and unprotected reefs indicated that finfish populations were ca. 4 x denser in protected than unprotected reefs. Sea urchin populations were >100 x denser and predation rates on a sea urchin, *Echinometra mathaei*, were 4 x lower in unprotected than in protected reefs. The balistidae (triggerfish) was the single sea-urchin finfish predator family which had a higher population density in protected than in unprotected reefs. Balistid density was positively correlated with predation rates on tethered *E. mathaei* ($r=0.88$; $p<0.025$) and negatively correlated with total sea-urchin density ($r=-0.89$; $p<0.025$) on the six reefs. We conclude from observations that the balistids *Balistapus undulatus* and *Rhinecanthus aculeatus* are the dominant sea-urchin predators. The sea-urchin assemblage had its greatest diversity and species richness at intermediate predation rates and low to intermediate sea-urchin densities. At low predation rates and high sea-urchin density *E. mathaei* dominated the assemblage's species composition. Preferential predation on the competitive dominant maintains the assemblage's diversity, supporting the compensatory mortality hypothesis (Connell 1978) of coral reef diversity. Protected reefs had greater cover of hard coral, calcareous and coralline algae, and greater substrate diversity and topographic complexity than unprotected reefs which had greater algal turf and sponge cover. Coral cover and topographic complexity were negatively correlated with total sea urchin density. Although experimentation is lacking, these substrate changes may be due to the switch from finfish to sea-urchins as consumers which results from overfishing of finfish. Removal of top invertebrate-eating carnivores appears to have cascading effects on the entire coral reef ecosystem

Notes: 6255

'File' Attachments: <internal-pdf://Mclanahan362-1444727552/Mclanahan362.pdf>

Language: English

Reference Type: Journal Article

Record Number: 256

Author: D. O. Sigana, K. M. Mavuti and R. K. Ruwa

Year: 2009

Title: Fish species composition and distribution in Kilifi Creek

Journal: Advances in Coastal Ecology

Type of Article: African Studies Centre

Short Title: Fish species composition and distribution in Kilifi Creek

Legal Note: Kenya

Keywords: Fish composition, diversity, Kilifi Creek, seasonality

Abstract: Ecological variation along the Kenyan coast influences fisheries composition. Kilifi Creek is a unique ecosystem along this coast because it is an open lagoon. A study of the fisheries fauna of

Kilifi Creek was conducted between October 2002 and September 2004 at eight sites situated from the mouth to deeper waters within the creek. Monthly sampling for diversity and

distribution revealed four crustacean and 63 finfish species. The crustaceans included two prawn species (*Penaeus indicus*, *P. monodon*) and two crab species (*Portunus pelagicus*, *Scylla serrata*). Crabs were absent from the Konjora site while prawns were absent from the deep sites within the creek. Fish in the order Perciformes dominated the catch at all the sites consisting of 74-95% of the catch. The fishery species landings were higher during the north-east monsoon (October-March) compared to the south-east monsoon (April-September) but Margalef's species richness index ($p=0.88$), Shannon-Weiner ($p=0.6$), Pielou's evenness ($p=0.05$), and Simpson's index ($p=0.5$) were not significantly different between seasons. Monthly measurements of physico-chemical parameters also revealed that there were significant differences in the phosphate concentration ($p=0.0$) and temperature ($p=0.0$) between the north-east and south-east monsoon season but not in other physico-chemical parameters. The finfish composition differed at the different sites and a principal component analysis indicated that water transparency and depth were the main determinants of finfish distribution.

Notes: 6256

'File' Attachments:

internal-pdf://Advances_in_coastal_ecology_Sigana[1][1]-1090893568/Advances_in_coastal_ecology_Sigana[1][1].pdf

Language: English

Reference Type: Journal Article

Record Number: 257

Author: G. M. Okemwa, B. Fulanda, E. N. Kimani and J. Ochiwo

Year: 2009

Title: Exploitation of marine aquarium reef fisheries at the Kenyan Coast

Journal: Advances in Coastal Ecology

Type of Article: Journal Article

Short Title: Exploitation of marine aquarium reef fisheries at the Kenyan Coast

Legal Note: Kenya

Abstract: Kenya ranks among the top exporting countries in the marine aquarium trade within the Western Indian Ocean region. However the fishery has received limited attention by way of research and monitoring despite being established during the mid 1970's. This paper provides a detailed overview of the dynamics of the fishery based on results of a one-year survey conducted during 2005 to determine the species harvested in the fishery and the harvest and export trends. Available government statistics, logbook returns of fish collectors at the Shimoni area and airfreight data were examined to assess the catch and export dynamics of the fishery. An estimated total of 193 fish species were harvested from the Kenya coast for export. Of the total number of individuals landed in Shimoni during the study period (including fish and invertebrates), fish made up approximately 97% of the catch with about 71% of the fish landed by divers. Approximately 70% of the fish belonged to 4 families namely Pomacentridae (damselfish), Labridae (wrasses), Acanthuridae (surgeonfish) and Gobiidae (gobies). Ten species made up 58% of the harvested catch topped by two species, *Amphiprion allardi* (10%) and *Centropyge acanthops* (9%). The mean daily CPUE of fish collectors in the Shimoni area was

estimated to be 25 individuals per fisherman per day, with divers landing significantly more fish than snorkellers. Among the key recommendations are the need to strengthen monitoring, to improve current regulatory mechanisms, and to promote strong stakeholder involvement in the management of the fishery. This study provides essential baseline information for further assessments of the status and sustainability of the fishery.

Notes: 6257

'File' Attachments: [internal-pdf://ASC-1253933-067\[1\]-3796330496/ASC-1253933-067\[1\].pdf](internal-pdf://ASC-1253933-067[1]-3796330496/ASC-1253933-067[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 258

Author: J. Hoorweg, N. Versleijen, B. Wangila and A. Degen

Year: 2009

Title: Income diversification and fishing practices among artisanal fishers on the Malindi-Kilifi coast

Journal: Advances in Coastal Ecology

Pages: 43-59

Short Title: Income diversification and fishing practices among artisanal fishers on the Malindi-Kilifi coast

Legal Note: Kenya

Keywords: Fishing, diversification, Malindi, Kilifi

Abstract: The fishing practices of fishers at ten landing sites in Malindi and Kilifi Districts that were surveyed in 1999 as part of a larger research project are discussed in this article. The focus of the research was on income diversification among fishers, pressure on marine resources and the relationship between the two. It was hypothesized that fishers with additional resources strengthen livelihood strategies and improve household security, and those who succeed in diversifying their incomes can be expected to have a more positive attitude towards conservation measures and will exact less pressure on marine resources. Two types of income diversification were distinguished: 1) 'activity' diversification at the individual level where fishers had other income besides fishing, and 2) 'earner' diversification at the household level where fishers belonged to a household with more than one income earner. Key indicators were selected that represented four features of artisanal fishing, namely: 1) the number of fishers; 2) the fishing grounds; 3) the type of equipment; and 4) the frequency of fishing. There was no significant relationship between 'earner' diversification and fishing practices while 'activity' diversification correlated significantly with two selected indicators. Fishers with 'multiple' activities used more destructive gear and fished inshore grounds more often, while there was no sign that they were more willing to stop fishing in favour of alternative employment. It was concluded that an activity diversification of fishers did not reduce the pressure on the marine environment. Instead the opposite occurred, fishers who had other employment onshore fished less prudently.

Notes: 6258

URL: <https://openaccess.leidenuniv.nl/bitstream/.../ASC-070744769-129-01.pdf>

'File' Attachments:

<internal-pdf://ASC-070744769-129-01-0481582848/ASC-070744769-129-01.pdf>

Language: English

Reference Type: Journal Article

Record Number: 259

Author: B. Kaunda-Arara and G. A. Rose

Year: 2006

Title: Growth and Survival Rates of Exploited Coral Reef Fishes in Kenyan Marine Parks Derived From Tagging and lengthFrequency Data

Journal: Western Indian Ocean Journal of Marine Science

Volume: 5

Issue: 1

Pages: 17-26

Short Title: Growth and Survival Rates of Exploited Coral Reef Fishes in Kenyan Marine Parks Derived From Tagging and lengthFrequency Data

Legal Note: Kenya

Keywords: Coral reef fishes, fish tagging, absolute growth rates, growth parameters, mortality rates, marine parks, FiSAT, Kenya

Abstract: Increments were obtained from 157 recaptured fishes and yielded estimates of absolute growth rates (em day⁻¹) for 11 species and growth parameters (K, L for 7 species. A total of 3,916 exploited coral reef fishes were tagged within Malindi and Watamu National Marine Parks, Kenya, in 2001 and 2002. Growth rates ranged over an order of magnitude among species. Of the dominant commercial species, the whitespotted rabbitfish, *Siganus sutor*, had both the highest absolute growth rate (21.9 ± 14.6 em yr⁻¹) and growth coefficient ($K = 1.2$ yr⁻¹), whereas emperors (*Lethrinus* spp.) had somewhat lower rates (overall mean 10.95 ± 3.65 em yr⁻¹; maximum for *L. nebulosus*, 4.6 ± 7.3 em yr⁻¹; $K = 0.92$ yr⁻¹). In contrast, the orangestriped triggerfish, *Balistapus undulatus*, had an average annual growth rate of only 2.0 ± 1.9 em. Growth coefficient (K) estimated for *S. sutor* and the sky emperor, *Lethrinus mahsena*, using length-frequency analysis (LFA) indicated a lower growth rate ($K=0.54$ yr⁻¹) for *S. sutor* than derived from tagging, but for *L. mahsena* the LFA-derived growth rate ($K=0.64$ yr⁻¹) was comparable to the K derived from tagging (0.57 /year). Growth rates estimated here for most, but not all species (*L. mahsena* in particular) were similar to those reported from other coral reef regions. Annual survival rates (S) derived from length-converted catch-curves were higher for *S. sutor* (0.145) than for *L. mahsena* (0.029), whereas, natural annual mortality rates (M) were comparable for the species (*S. sutor*, 1.12; *L. mahsena*, 1.25).

Notes: 6259

'File' Attachments: <internal-pdf://28494-16218-1-PB-4124029440/28494-16218-1-PB.pdf>

Language: English

Reference Type: Journal Article

Record Number: 260

Author: A. J. Mmochi, A. M. Dubi, F. A. Mamboya and A. Mwandya

Year: 2002

Title: Effects of Fish Culture on Water Quality of an Integrated Mariculture Pond System

Journal: Western Indian Ocean Journal of Marine Science

Volume: 1

Issue: 1

Pages: 53-63

Short Title: Effects of Fish Culture on Water Quality of an Integrated Mariculture Pond System

Legal Note: Kenya

Keywords: Integrated mariculture; water quality; nutrients; eutrophication; dissolved oxygen; fish culture; fish feed; seaweed culture; shellfish culture biofiltration; environmental pollution

Abstract: Six mariculture ponds were flooded with seawater since 1996. During this time the ponds were stocked with finfish (milkfish and rabbitfish), which were fed on locally produced fish feed. Some water quality parameters such as temperature, salinity and oxygen saturation were measured twice a day for three years (1998-2000), while nutrient concentrations were measured weekly for one year. Both nutrient concentration and oxygen saturation levels have shown a trend indicating eutrophication. Oxygen concentration changed from an average of 7.16 mg/l in October 1998 to 2.2 mg/l in March 2000 with a negative linear regression of 0.69 during the morning hours. From August 1998 to April 1999 dissolved inorganic ammonia concentration increased by 9 µg-at N/l, from 8.91 to 18.02 with a positive linear regression of 0.79. During this period soluble reactive phosphorus increased by 3.55 µg-at P/l from 4.36 to 7.91 with a positive linear regression of 0.75. In this paper the rate of eutrophication and the limit at which the ponds have to be dried/limed before restocking are discussed.

Notes: 6260

'File' Attachments: internal-pdf://WIOJ1153-3484200192/WIOJ1153.pdf

Language: English

Reference Type: Journal Article

Record Number: 261

Author: J. N. Kamau

Year: 2002

Title: Heavy metal distribution and enrichment at Port-Reitz Creek, Mombasa

Journal: Western Indian Ocean Journal of Marine Science

Volume: 1

Issue: 1

Pages: 65-70

Short Title: Heavy metal distribution and enrichment at Port-Reitz Creek, Mombasa

Legal Note: Kenya

Keywords: Fluvial sediments; heavy metals; port-Reitz

Abstract: Port-Reitz Creek (04°04' S, 39° 39' E) is one of the two main tidal mangrove fringed creeks found in Mombasa Island. It experiences semi-diurnal pattern of two low and two high tides every 24 hour cycle. Six stations were strategically positioned along the length of the creek and sampled for heavy metal (cadmium, copper, iron and zinc) content during July 1998. A peak of Cu and Zn (87 and 235 µg/g dry weight respectively) was observed at Station 2, which borders a steel factory and fish-processing firm. A correlation matrix showed close distribution pattern between Zn and Cu ($r = 0.67$) and between Fe and Cd ($r = 0.62$). A peak for Cd (6 µg/g dry wt) was observed at Station 3. Fluvial input in the creek was a source of Cd, Cu, Fe and Zn. Cd and Zn were of anthropogenic origin (Enrichment factor, $EF > 1$) while Cu seemed to be

depleted ($EF < 1$). Lateral distribution of Cd, Cu, Fe and Zn on surface sediments showed a decline in concentration in a seaward direction.

Notes: 6261

'File' Attachments: [internal-pdf://Kamau-2069118976/Kamau.pdf](#)

Language: English

Reference Type: Journal Article

Record Number: 262

Author: J. Mwaluma

Year: 2002

Title: Pen Culture of the Mud Crab *Scylla* Mangrove System, Kenya

Journal: Western Indian Ocean J. Marine Science

Volume: 1

Issue: 2

Pages: 127-133

Short Title: Pen Culture of the Mud Crab *Scylla* Mangrove System, Kenya

Legal Note: Kenya

Keywords: Mud crab; *Scylla serrata*, pen culture; mangrove, Mtwapa, Kenya

Abstract: A pen culture system of the mud crab, *Scylla serrata* was introduced in Mtwapa mangrove creek with the aim of finding an alternative source of income and food for the local communities, who practice artisanal fishery in the creek. Other objectives were to motivate the interaction between scientists and the community through technology transfer, and to collect scientific data necessary for maintenance and management of the culture system. Pen construction took place from October 2000 -January 2001. The pen was located in the intertidal area and measured 800 m². It was constructed and fenced using uzio (fish trap) material made of mangrove poles and wood. Stocking of the pen with seed crabs occurred from February-May 2001. Local sources was used to obtain a total of 1697 crab seeds which were measured (carapace length and width), weighed and sexed before stocking. The crabs were fed with trash fish obtained from a local fish processing plant. Feeding was conducted once daily, preferably at high tide. Salinity of the pond ranged from 12.8 to 35 ppt; temperature between 25 and 36 degrees C, pH from 7.95-8.25 and dissolved oxygen (DO) from 2.65-4.00 mgn. Harvesting of the crabs started after 4 months from date of stocking. Additional activities that occurred in the pen were planting of suitable mangrove seeds (*Rhizophora mucronata* and *Avicennia marina*) in the bare areas of the pen. These provided canopies for the crab as well as reforesting the area.

Notes: 6262

'File' Attachments: [internal-pdf://Mwaluma-2002-2019648768/Mwaluma-2002.pdf](#)

Language: English

Reference Type: Journal Article

Record Number: 263

Author: A. J. Kulmiye

Year: 2002

Title: Some Aspects of the Reproductive Biology of the Thumbprint Emperor, *Lethrinus harak* (Forsskal, 1775), in Kenyan Coastal Waters

Journal: Western Indian Ocean Journal of Marine Science

Volume: 1

Issue: 2

Pages: 135-144

Date: 2002

Type of Article: Journal Article

Short Title: Some Aspects of the Reproductive Biology of the Thumbprint Emperor, *Lethrinus harak* (Forsskal, 1775), in Kenyan Coastal Waters

ISSN: 0856-860x

Legal Note: Kenya

Keywords: *Lethrinus harak*

reproduction

maturity stages

Kenya, Indian Ocean

Abstract: Some aspects of the reproductive biology of the thumbprint emperor, *Lethrinus harak*, (Forsskal, 1775) in Kenyan coastal waters were studied from April 1995 to March 1996. Six maturity stages were described for gonad development based on external features. For females, these stages were validated by histological examination of the ovary and by taking oocyte diameter measurements. Size-related discrepancy in male to female sex ratio was observed where males generally predominated in the smaller sizes and females in the larger sizes. *Lethrinus harak* has a prolonged spawning season extending from October to April with peaks in October and February. The minimum size at which 50% of males and females attain first sexual maturity was estimated to be 24.2 and 26.4 cm total body length respectively.

Notes: 6263

URL: www.oceandocs.org/bitstream/1834/35/1/WIOJ12135.pdf

'File' Attachments: [internal-pdf://Kulmiye2002-0273642752/Kulmiye2002.pdf](#)

Author Address: Department of Zoology, Department of Veterinary Anatomy, University of Nairobi, P.O. Box 30197, Nairobi, Kenya

Language: English

Reference Type: Journal Article

Record Number: 264

Author: J. A. Nyunja, K. M. Mavuti and E. Wakwabi

Year: 2002

Title: Trophic Ecology of *Sardinella gibbosa* (Pisces: Clupeidae) and *Atherinomorous lacunosus* (Pisces: Atherinidae) in Mtwapa Creek and Wasini Channel, Kenya

Journal: Western Indian Ocean Journal of Marine Science

Volume: 1

Issue: 2

Pages: 181-189

Short Title: Trophic Ecology of *Sardinella gibbosa* (Pisces: Clupeidae) and *Atherinomorous lacunosus* (Pisces: Atherinidae) in Mtwapa Creek and Wasini Channel, Kenya

Legal Note: Kenya

Keywords: Trophic ecology; planktivorous fishes; habitat variability

Abstract: The food habits of two schooling planktivorous fishes, *Sardinella gibbosa* and *Atherinomorous lacunosus*, were investigated in Mtwapa creek and Wasini Channel of the Kenya coast. Spatial and temporal variations in their food and feeding habits were assessed using the percentage numerical abundance method, percentage frequency of occurrence, stomach fullness indices and the Tokeshi graphical method. This study established a clear spatial separation of Mtwapa creek from Wasini Channel in terms of the abiotic and biotic data. Highly significant differences (t-test, $p < 0.05$) were observed between the two study areas in temperature, salinity, transparency, conductivity, chlorophyll a and in zooplankton abundance and diversity. The diet of the two fish species showed clear spatial and temporal differences, which were dependent on habitat variability. The two species belong to the omnivorous trophic category. *Sardinella gibbosa* from both sites fed mostly on copepods during the two seasons. *Atherinomorous lacunosus* fed mostly on phytoplankton, copepods and nematodes during the NE Monsoon. However, its diet was dominated by nematodes during the SE Monsoon. Overall, both fish species exhibited generalised and opportunistic feeding habits. Their diet was influenced by changes in the quality and quantity of food in the environment and the fishes migratory patterns.

Notes: 6264

'File' Attachments: <internal-pdf://WIOJ12181-1348851200/WIOJ12181.pdf>

Language: English

Reference Type: Journal Article

Record Number: 265

Author: K. M. Mavuti, J. A. Nyunja and E. O. Wakwabi

Year: 2004

Title: Trophic ecology of some common juvenile fish species in Mtwapa creek, Kenya

Journal: Western Indian Ocean Journal of Marine science

Volume: 3

Issue: 2

Pages: 179-187

Date: 2004

Type of Article: Journal Article

Short Title: Western Indian Ocean J. Mar. Sci.

ISSN: 0856-860x

Legal Note: Kenya

Keywords: Diets

Ecology

Feeding behaviour

Marine fish

Trophic levels

Kenya

Abstract: The trophic status of common fish species in Mtwapa creek on the Kenyan coast was studied. Both the qualitative and quantitative spectra of the diets of these fish species were investigated. It was found that the eight most abundant fish species, *Sardinella gibbosa*, *Pellona ditchella*, *Spratelloides delicatulus*, *Atherinomorous lacunosus*, *Gerres oyena*, *Secutor insidiator*

and *Leiognathus equula*, consumed principally copepods, while *Selar crumenophthalmus* fed mainly on fish scales. Polychaetes were an important diet for *Gerres oyena* and *Leiognathus equula*. *Spratelloides delicatulus* was a carnivore feeding only on zooplankton and zoobenthos, and had the lowest diet diversity ($H' = 0.40$). The rest were omnivorous. *Sardinella gibbosa*, *P. ditchella*, *L. equula*, *Sec. insidiator*, *G. oyena* and *Sel. crumenophthalmus* fed on phytoplankton, zooplankton, zoobenthos and detritus with a relatively higher diet diversity ($H' = 0.68-0.96$). *Atherinomorous lacunosus* did not take detritus in its diet and it had a lower diet diversity compared to the other omnivores ($H' = 0.47$).

Notes: 6265

URL: ajol.info/index.php/wiojms/article/view/28460/5141

'File' Attachments: internal-pdf://28460-16187-1-PB-2424793600/28460-16187-1-PB.pdf

Author Address: Kenya Marine and Fisheries Research Institute, P.O Box 1804 Kisumu Kenya, jnyunja@yahoo.com

Language: English

Reference Type: Journal Article

Record Number: 266

Author: G. Hemery and T. R. McClanahan

Year: 2005

Title: Effect of recreational fish feeding on reef fish community composition and behavior

Journal: Western Indian Ocean Journal of marine science

Volume: 4

Issue: 2

Pages: 123-133

Date: 2005

Type of Article: Journal Article

Short Title: Western Indian Ocean J. Mar. Sci.

ISSN: 0856-860X

Legal Note: Kenya

Keywords: Coral reefs

Feeding behaviour

Marine parks

Reef fish

Sport fishing

Tourism

Abstract: Feeding fish with bread or other food is widely used by tour operators to enhance human-animal interactions in coral reefs. Little is known, however, about the effects of recreational fish feeding on fish community structure and fish behaviour. These two issues were examined in this study within three marine protected areas of Kenya by comparing data from sites frequently used to feed fish and control sites not frequently visited by tour operator. The effects of feeding on community structure and fish behaviour were investigated through underwater visual surveys and fish feeding experiments, using bread. The numbers of individuals and species of fish at the feeding sites were higher than at control sites. This result suggests that the abundance of bread-feeding fish does not significantly negatively effect

non-bread feeder population or total biodiversity. The main result of the fish behaviour study was that the reaction to bread at feeding sites was quicker than at control sites, which indicates that some species learn to feed on this novel source of food.

Notes: 6266

URL: ajol.info/index.php/wiojms/article/view/28482/5160

'File' Attachments: internal-pdf://28482-16206-1-PB-3950871040/28482-16206-1-PB.pdf

Author Address: University of Newcastle, Department of Marine Sciences and Coastal Management, Ridley Building, Newcastle-upon-Tyne, NE1 7RU, United Kingdom, gwenahemery@yahoo.com

Language: English

Reference Type: Thesis

Record Number: 267

Author: S. Hemphill

Year: 1995

Title: The Ecology and Exploitation of Yellowfin Tuna, *Thunnus albacares* (Bonnaterre 1788) in the Pemba Channel, Kenya

City: University of Wales, UK

Degree: PHD

Thesis Type: PHD THESIS

Short Title: The Ecology and Exploitation of Yellowfin Tuna, *Thunnus albacares* (Bonnaterre 1788) in the Pemba Channel, Kenya

Keywords: Yellowfin Tuna, sport fishery, Pemba Channel, stock assessment

Abstract: This thesis evaluates the utility of a sport fishery for yellowfin tuna, *Thunnus albacares*, in the Pemba Channel, Kenya, in providing ecological information relevant to commercial fishery assessment and management. Age, growth, reproductive status and diet are measured, together with an innovative assessment of the Indian Ocean yellowfin tuna stock. Catch/Effort and weight data from the records of the sport fishery from 1963-1995 demonstrate a decline in tuna mean weight since the advent of purse seining in 1984. A periodicity of 5-6 years was detected in the Indian Ocean longline fishery catches, and in the sport fishery catch/effort and mean weights. Samples were taken from tuna caught in the sport fishery from 1981-88. Sport-fished samples were more random in size, age and sex (ratio= 1:1) than catches from any of the three major commercial fisheries. The total mortality rate of cohorts deconvoluted from weight-frequencies in the sport fishery catch over 6 years was used in a Caddy and Csirke analysis. Maximum Sustainable Yield estimates of the Indian Ocean stock were 113,000 tonnes (new method), 110-160,000 tonnes (Walters' method); compared with only 40-52,000 tonnes using the standard equilibrium method. Tuna (1653 over 7 years) were successfully aged using length frequency analysis and by a novel method based on clusters from a Principal Components Analysis of morphometric measures. Juvenile growth was fast, 3.1 cm/month, whereas adults grew at about 2 cm/month. Gonads (>1500) were staged for 5 years and histologically examined for 2 years. Female yellowfin mature earlier than males, but males become ripe earlier in the season. The spawning stock consists of females >120 cm FL. Diet was scored over 4 years and evaluated volumetrically over 2 years. Juvenile tuna eat fish, but adults opportunistically consume fish, cephalopods and crabs, depending on availability. Catchability

by gear in both the sport and commercial fisheries is likely influenced by the currently abundant food.

Notes: 6267

'File' Attachments:

internal-pdf://HAMPALL'S_tHESIS[1]-2114253824/HAMPALL'S_tHESIS[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 268

Author: M. Huxham, E. Kimani and J. Augley

Year: 2008

Title: The Fish Community of an East African Mangrove: Effects of Turbidity and Distance from the Sea.

Journal: Western Indian Ocean Journal of Marine Science

Volume: 7

Issue: 1

Pages: 57-67

Date: 2008

Type of Article: Journal Article

Short Title: Western Indian Ocean J. Mar. Sci.

ISSN: 0856-860X

Legal Note: Kenya

Keywords: Community composition

Mangroves

Marine fish

Predators

Turbidity

Abstract: Mangroves are often reported as nursery grounds for fish. Fish may enter mangroves in order to avoid predators, but may not need to do so if turbidity provides a sufficient predator refuge outside the forest. This study assessed the effects of turbidity in the field and laboratory on mangrove fish community structure and behaviour. The extent to which fish penetrate into mangroves has received little attention. This study also looked at differences in fish community structure at mangrove sites near (6m) and far (200m) from the mangrove/sea boundary. Twelve field samples were taken at approximately monthly intervals from replicate 25m² landward and seaward plots, in a *Sonneratia alba* stand at Gazi Bay, Kenya. A total of 25 species of fish were caught, 15 in seaward plots and 13 in landward ones. Mean abundance for all plots and sampling times was 2.15 (equivalent to 0.09 m⁻²). Seaward plots had a total mean abundance more than twice that of landward plots (2.75±1.9 S.D. vs. 1.23±0.33 S.D. respectively). There was no relationship between abundance and turbidity.

Notes: 6268

URL: ajol.info/index.php/wiojms/article/view/48254/34616

'File' Attachments: internal-pdf://48254-62000-1-PB-0914013441/48254-62000-1-PB.pdf

Author Address: School of Life Sciences, Napier University,, Edinburgh, Scotland EH10 5DT
United Kingdom, m.huxham@napier.ac.uk
Language: English

Reference Type: Journal Article

Record Number: 269

Author: T. R. McClanahan, J. C. Castilla, T. Alan, A. T. White and O. Defeo

Year: 2009

Title: Healing small-scale fisheries by facilitating complex socio-ecological systems.

Journal: Rev Fish Biol Fisheries

Volume: 19

Issue: 33–47

Short Title: Healing small-scale fisheries by facilitating complex socio-ecological systems.

Legal Note: Kenya

Abstract: The current global fisheries crises have immense implications for the health and viability of animal populations, as well as the ecosystems and habitats that support this biodiversity. These crises have provoked a wide variety of management solutions and alternatives that are closely aligned with other small-scale resource extraction conservation approaches, but have been analyzed separately from the common-pool resource management literature. We summarize findings from an analysis of progressive small-scale fisheries worldwide and find that solutions arise from a historical trial and error management process as problems become dire. We find high success in the social organization and regulation of resources among these progressive fisheries but poor evidence for improved ecosystems. Based on evidence provided by the most progressive fisheries, we suggest a change in policy towards the management of small-scale fisheries. This change includes four major avenues of problem solving that focus on facilitating socio-ecological processes rather than primarily promoting a high level of quantitative science and implementing findings, technological concepts, or tools. Adoption is often culturally and context specific and, therefore, the above often have poor success when not socially integrated. We encourage facilitating and catalyzing local-level adoption of rules that create limits to appropriation and technology, since it is increasingly recognized that such limits are key solutions to the threats. This will be achieved if policy and actions (1) encourage professionalism (formation of “societies”, setting standards, certification, self-policing, appropriate technology, etc.), (2) create forums where all opinions about solutions, the status of targeted species, and environmental requirements are represented, (3) promote social rules that consider the realities and limits of the households and local social economy, and (4) craft solutions tailored to the specific and agreed upon diagnoses. We predict that as this socio-ecological process matures, it will also increase the inclusiveness of resource management goals to include non-use factors, such as biodiversity and other ecosystem services, which are still poorly evaluated and managed in even the most progressive small-scale fisheries.

Notes: 6269

'File' Attachments: internal-pdf://Healing-2618533121/Healing.pdf

Language: English

Reference Type: Magazine Article
Record Number: 270
Author: S. Hemphill
Year: 2008
Title: Tuna Fisheries: A Management Conundrum.
Magazine: Samaki news
Publisher: FD
Volume: 5
Issue Number: 1
Pages: 17-18
Short Title: Tuna Fisheries: A Management Conundrum.

Abstract: The tuna stocks of the Western Indian Ocean have been exploited commercially by ships from the Distant Water Fishing Nations (DWFNs) since 1954 when the Japanese long liners pioneered the fishery. Other nations including South Korea and Taiwan soon joined in and up until the mid-1980, the tuna stocks were exploited almost exclusively by long liners from these three countries. In 1984, French and Spanish purse seiners entered the Indian Ocean from the Atlantic to participate in the fishery. Since that time, increasing numbers of purse seiners entered the fishery, with the majority coming from Spain followed by France mostly based out of Mauritius, Reunion and the Seychelles where a large tuna cannery was built. Since the mid-1980s, the fleet has spread out from the Seychelles in search of new grounds and the catches of tunas increased by more than ten times that previously registered by long lining alone. Skipjack tunas previously only exploited by the Maldivian artisanal pole-and-line fishery were now a major target species of the purse seine fishery. In recent years, there has been a significant increase in the number of long liners designed to target the broad bill swordfish (*Xiphias gladius*) that was formerly caught only as a by-catch. First, part of the Taiwanese long line fleet changed over from tunas to swordfish and then other nations including France and Spain followed suit. By the nature of their gear, the long line fishery only exploits large adult tunas, billfishes, sharks and other large fishes that live deep along the thermocline. Juvenile bigeye and yellowfin tunas as well as skipjack tunas remain near the surface, hence are not targeted by the long liners. After sexual maturity, bigeye and yellowfin tunas spend most of their life in the cooler, oxygen rich layers on the thermocline. Purse seining is a surface fishery, hence targets adult tunas whilst they remain in surface layers, juveniles of these species as well as skipjack tuna.

Notes: 6270

'File' Attachments: internal-pdf://Samaki_News[1]-0892658176/Samaki_News[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article
Record Number: 271
Author: C. Mageria, O. Makogola and S. Ndegwa
Year: 2008
Title: Current Status of Kenyan Coastal Fisheries.
Magazine: Samaki news

Place Published: FD, KMFRI

Publisher: FD

Volume: 5

Issue Number: 1

Pages: 6-7

Short Title: Current Status of Kenyan Coastal Fisheries.

Abstract: Kenya's fisheries sub-sector contributes approximately 0.5% of the total GDP. The coastal and marine artisanal production is approximately 8,000 Metric tonnes with exports of fish and fish products averaging 10,000 metric tons valued at Kshs.1.5 billion.

Notes: 6271

'File' Attachments: internal-pdf://Samaki_News[1]-3711251968/Samaki_News[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article

Record Number: 272

Author: G. W. Maina, D. Obura and H. M. Alidina

Year: 2008

Title: The Importance of Fish Catch Data in investigating Reef Fish Spawning Aggregations.

Magazine: Samaki news

Place Published: FD, KMFRI

Publisher: FD

Volume: 5

Issue Number: 1

Pages: 13-14

Short Title: The Importance of Fish Catch Data in investigating Reef Fish Spawning Aggregations.

Keywords: Reef fishes, spawning aggregation, catch

Abstract: Many coral reef fish species form aggregations at specific times and places for the purpose of spawning. This phenomenon is known to fishermen; hence making it possible for them to identify where and when Fish Spawning Aggregations (FSAs) occur hence threatening their existence. Information about the location and seasonality of potential and existing FSAs can be compiled from several sources such as fishers' knowledge, fish catch data, direct observations and specific monitoring programs. However, published information on this occurrence of FSAs in East Africa is scanty. Recent work on reef fish spawning aggregation in Kenya has been conducted using local fishers' ecological knowledge as key sources of information. These studies recommended further investigation of some likely FSA sites and species on the southern coast of Kenya. Use of Catch data to identify peak catches may point to the existence of FSAs or other aggregations related to feeding, schooling or migrations. In addition, these catch trends could also be influenced by weather conditions, fishing effort and other natural and human dynamics. This study used six years of fish catch data from Diani-Chale, Southern Kenya to investigate potential FSA sites and species. The data were analyzed for monthly 'peaks' of unusually high catches of eight fish species; *Siganus sutor*; *Lutjanus*

sanguineous, Lutjanus gibbus, Lutjanus bohar, Lutjanus argentimaculatus, Epinephelus fuscoguttatus, Mulloidichthys vanicolensis and Plectorhinchus spp.

Notes: 6272

'File' Attachments: internal-pdf://Samaki_News[1]-1798667520/Samaki_News[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article

Record Number: 273

Author: T. R. McClanahan

Year: 2008

Title: Establishing Sustainable targets For Kenyan Coral Reef Fisheries.

Magazine: Samaki news

Place Published: FD

Publisher: FD

Volume: 5

Issue Number: 1

Pages: 11-12

Short Title: Establishing Sustainable targets For Kenyan Coral Reef Fisheries.

Keywords: Fish biomass, biodiversity, effort

Abstract: Kenyan marine near shore fisheries are well exploited, often well beyond Maximum Sustained Yields (MSYs). Many of the fished ecosystems are heavily degraded in terms of biodiversity and ecological functions. There is a growing awareness that practices need to change and there are efforts to alleviate the problem. This paper describes an opportunity to improve the chances for sustainability by establishing a target goal for fish biomass and biodiversity that can provide an objective decision for allocating fishing effort.

Notes: 6273

'File' Attachments: internal-pdf://Samaki_News[1]-3795175168/Samaki_News[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article

Record Number: 274

Author: B. Mwaka, S. Nuguti and C. Ndoro

Year: 2008

Title: Fisheries co-management Through Establishment of Beach Management Units Along the Kenyan Coast.

Magazine: Samaki news

Place Published: FD, KMFRI

Publisher: FD

Volume: Vol. 5

Issue Number: no. 1

Pages: pp. 33-34

Short Title: Fisheries co-management Through Establishment of Beach Management Units Along the Kenyan Coast.

Keywords: Fisheries management, illegal fishing gears, co-management

Abstract: Kenya's fisheries resources have been managed through a centralised framework drawing its mandate from the Fisheries Act Cap 378 of the laws of Kenya. These laws and regulations have been revised over time as determined by new research findings. In this arrangement, the Fisheries Officers are the sole enforcement agents at the national and district level. In the recent past, the human capacity of the Fisheries Department has greatly reduced as a result of natural attrition and the recruitment embargo instituted by the government. This coupled with reduced financing of the department and rising operational costs has reduced the government's ability to effectively manage fisheries. This has resulted to increased use of illegal fishing gears and methods. To address the situation, the Fisheries Department has introduced the concept of co-management, which involves sharing responsibilities for resource management by involving other stakeholders in decision making and law enforcement.

Notes: 6274

'File' Attachments: internal-pdf://Samaki_News[1]-3140884736/Samaki_News[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article

Record Number: 275

Author: S. Ndegwa, P. Kimani and H. M. Allidina

Year: 2008

Title: Testing Participatory Fish Stock Assessment (Parfish) on the Kenyan Coast.

Magazine: Samaki news

Volume: 5

Issue Number: 1

Pages: 35-36

Short Title: Testing Participatory Fish Stock Assessment (Parfish) on the Kenyan Coast.

Keywords: ParFish, Stock Assessment, small-scale fisheries,

Abstract: Participatory Fisheries Stock Assessment (ParFish) is a rapid and participatory approach to stock assessment for small scale fisheries. The approach is based on adaptive learning where the impacts of stock management actions are assessed and periodically evaluated to reformulate appropriate plans and actions. The main objectives of ParFish are to encourage participation of fishers and other key stakeholders in fisheries management, to generate knowledge of the fishery and to develop management action plans. The specific objectives were to assess the impact of fishing on stock size, to estimate the outcomes of different levels of fishing and to involve fishers and other stakeholders in stock assessments and decision making.

Notes: 6275

'File' Attachments: internal-pdf://Samaki_News[1]-2402709760/Samaki_News[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article

Record Number: 276

Author: D. W. Nyingi, J. K. Carlson, C. J. Matingi and G. C.

Year: 2008

Title: Factors Affecting Sawfish Population on the Kenyan Coast.

Magazine: Samaki news

Place Published: FD, KMFRI

Publisher: FD

Volume: Vol. 5

Issue Number: no. 1

Pages: pp. 30-32.

Short Title: Factors Affecting Sawfish Population on the Kenyan Coast.

Keywords: Sawfish, Elasmobranch,

Abstract: Sawfishes are a family of seven species that were historically widespread in tropical to temperate waters, especially near shore marine habitats, estuaries, large rivers, and some lakes (Poulakis and Seitz, 2004; Peverell, 2005; Simpfendorfer and Wiley, 2005). This family of fish belongs to the group of cartilaginous fishes or elasmobranchs (sharks, rays, and chimeras). The group is seriously depleted globally primarily due to international trade in their parts and derivatives. They also have low reproductive rate which makes them particularly vulnerable to excessive mortalities and rapid population declines (Clark et al., 2004). Sawfish are targeted for international trade and utilized as live animals for aquaria, their meat, fins and rostral saws. Opportunistic trade in sawfish parts already exists in South East Asia, Hong Kong, Tanzania, Brazil, and Madagascar. Ongoing daily trade in sawfish rostra occurs on many online auction houses such as the website eBay. Sawfish also appear in a published list of the approximately 40 fin types recognized by Hong Kong fin traders. In response to global concern, Kenya and the United States of America jointly proposed all species in the Family Pristidae (sawfishes) for inclusion in Appendix I of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) during the 14th Conference of the Parties (CoP14) held from 3-16 June 2007 in The Hague (Netherlands).

Notes: 6276

'File' Attachments: internal-pdf://Samaki_News[1]-2838934272/Samaki_News[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article

Record Number: 277

Author: S. Nzuki

Year: 2008

Title: Endangered Sea Turtles as a Flagship for the Management of Marine Fisheries.

Magazine: Samaki news

Volume: Vol. 5

Issue Number: no. 1

Pages: pp. 59-60.

Short Title: Endangered Sea Turtles as a Flagship for the Management of Marine Fisheries.

Abstract: The degradation of marine habitats has a negative impact on marine turtle populations that are an integral component of healthy marine ecosystems, Sea turtle population demographics have been shown to reflect the effects of natural and anthropogenic stressors that include environmental variability, terrestrial habitat loss, and terrestrial and aquatic habitat degradation. Their threatened status has necessitated complete protection in many areas, for example in Kenya, sea turtles are protected under both the Fisheries Act (Cap 378) and the Wildlife Conservation and Management Act (Cap 376). Their endangered status is listed in Appendix 1 of the Convention on International Trade in Endangered Species (CITES). They are also classified as endangered in other international regulatory instruments such as the Convention on Migratory Species (CMS).

Notes: 6277

'File' Attachments: internal-pdf://Samaki_News[1]-4080459776/Samaki_News[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article

Record Number: 278

Author: J. Ochiwo

Year: 2008

Title: Socio-Economic aspects of the Kenyan Marine Fisheries.

Magazine: Samaki news

Place Published: FD, KMFRI

Publisher: FD

Volume: Vol. 5

Issue Number: no. 1

Pages: pp. 37-41

Short Title: Socio-Economic aspects of the Kenyan Marine Fisheries.

Keywords: Fisheries, fishing gears

Abstract: Traditionally, the marine inshore fisheries and mangrove exploitation provide important sources of livelihood and income to the Kenyan coastal communities. Kenya is endowed with a rich inshore marine fishery with the most productive fishing grounds located around the Lamu, Kiunga, Kizingitini and Faza in the north and in the Malindi-Ungwana Bay, as well as in the south coast around Majoreni and Vanga (Ruwa et al., 2003). The inshore fishery is mainly exploited by artisanal fishers who use simple non-motorized fishing vessels that cannot venture into the deeper waters. They also use simple fishing gears with the most common being gillnets, shark nets, hook and line, beach seines and traditional traps especially the basket traps.

Notes: 6278

'File' Attachments: internal-pdf://Samaki_News[1]-1765219840/Samaki_News[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 279

Author: B. I. Crona and P. Rønnbock

Year: 2007

Title: Community structure and temporal variability of juvenile fish assemblages in natural and replanted mangroves, *Sonneratia alba* Sm., of Gazi Bay, Kenya.

Journal: Estuarine, Coastal and Shelf Science

Volume: 74

Pages: 44–52.

Date: 2007

Type of Article: Journal Article

Short Title: Community structure and temporal variability of juvenile fish assemblages in natural and replanted mangroves, *Sonneratia alba* Sm., of Gazi Bay, Kenya.

Legal Note: Kenya

Keywords: Juvenile fish, fish abundance, Gazi Bay

Abstract: The juvenile fish community associated with natural, degraded and replanted *Sonneratia alba* mangroves in Gazi Bay was sampled during the South East and North East monsoons between April 2002 and June 2003. A total of 1800 individuals belonging to 49 taxa and 34 families were collected from the intertidal forest using stake nets. Fish abundance ranged from $0.93 \pm 0.20 \text{ ind. m}^{-2}$ (SEM02) to $1.16 \pm 0.18 \text{ ind. m}^{-2}$ (SEM03) between seasons and between $0.54 \pm 0.07 \text{ ind. m}^{-2}$ and $1.64 \pm 0.33 \text{ ind. m}^{-2}$ for individual sites across seasons. Five taxa accounted for approximately 70% of the total fish abundance, with Gobidae and Gerres oyoena dominating. ANOSIM revealed seasonal differences in fish species composition and abundance ($p=0.01$) due to fluctuating abundances of primarily *Terapon* sp. and *Thryssa* sp. The majority (65%) of fishes were reef associates, which implies a tight coupling between mangroves and coral reefs. The high proportion (75%) of commercial species indicates that fringing *S. alba* mangroves of Gazi Bay are important in sustaining coastal fisheries in the area. The fact that the replanted mangroves of Gazi Bay harbor a significant number of commercially important species as juveniles suggest their function as nursery habitats for nekton may well have been restored. This study is original in quantitatively evaluating the use of replanted intertidal mangroves by juvenile fish in the West Indian Ocean; a topic poorly studied worldwide to date.

Notes: 6279

'File' Attachments: <internal-pdf://Crona2007-1150364416/Crona2007.pdf>

Language: English

Reference Type: Journal Article

Record Number: 280

Author: M. Huxham, E. Kimani, J. Newton and J. Augley

Year: 2007

Title: Stable isotope records from otoliths as tracers of fish migration in a mangrove system

Journal: Journal of Fish Biology

Volume: 70

Issue: 5

Pages: 1554-1567

Short Title: Stable isotope records from otoliths as tracers of fish migration in a mangrove system

Legal Note: Kenya

Keywords: Fish, migration, otolith

Abstract: The ratios of stable isotopes $\text{super}(18)\text{O}:\text{super}(16)\text{O}$ and $\text{super}(13)\text{C}:\text{super}(12)\text{C}$ were measured in otolith carbon taken from nine species of fishes caught within mangroves and on the reef at Gazi Bay, Kenya. Before analysis, otoliths were divided into 'larval' 'post-larval' and 'adult' sections using a drill. Fishes were putatively classified as 'mangrove residents' 'offshore residents' or 'migrants' on the basis of information from the literature, and depending on where they were caught (mangroves only, offshore only or both mangroves and offshore) in the present study. Eight of the species exhibited an increase in otolith $\text{super}(13)\text{C}:\text{super}(12)\text{C}$ with age, but this was significant only in the two migrant species *Lethrinus harak* and *Lutjanus fulviflammus*. There were no consistent patterns in $\text{super}(18)\text{O}:\text{super}(16)\text{O}$ with age, or between migrants and non-migrants. These results suggest that comparing absolute values of otolith oxygen and carbon isotope signatures between fish species is not a useful way of determining migration patterns at this site, because of species-specific differences in carbon metabolism and insufficiently steep gradients in temperature and salinity. Changes in carbon isotope signatures between life stages within a species, however, do hold promise as migration tracers.

Notes: 6280

URL:

<http://login.oaresciences.org/whalecomwww3.interscience.wiley.com/whalecom0/cgi-bin/fulltext/118483375/PDFSTART>

'File' Attachments: internal-pdf://Huxman & Kimani-2428089600/Huxman & Kimani.pdf

Language: English

Reference Type: Journal Article

Record Number: 281

Author: M. Crabbe and T. R. McClanahan

Year: 2006

Title: A Biosocioeconomic Evaluation of Shipwrecks Used for Fishery and Dive Tourism Enhancement in Kenya

Journal: Western Indian Ocean Journal of Marine Science

Volume: 5

Issue: 1

Pages: 35-53

Date: 2006

Type of Article: Journal Article

Short Title: A Biosocioeconomic Evaluation of Shipwrecks Used for Fishery and Dive Tourism Enhancement in Kenya

Legal Note: Kenya

Keywords: Artificial reefs, fisheries, tourism

Abstract: The use of artificial reefs as a management tool to enhance both dive tourism and fisheries has been poorly studied, often resulting in permanent structures created with little

knowledge of their impacts. This study specifically evaluated the use of three shipwrecks, off the coast of Kenya, using biosocioeconomic assessments to quantify the benefits. The results show a short-term increase in fish catch for speargun fishermen but a decrease for hook and line fishermen and no evidence for the sustainable use. The economic benefit to the speargun fishermen was estimated to be an additional US\$1,000 annually, although from the use of semistructured interviews, the fishermen perceived little benefit from the shipwrecks. The economic benefit from enhanced dive tourism was estimated as US\$75,000-\$174,000 annually and there was generally a high awareness by all stakeholders of the social benefits of the shipwrecks to the local community. The results from the present study suggest that the major use of shipwrecks is to enhance dive tourism and not the enhancement of fisheries. Diver operators are the main beneficiaries of shipwrecks and should, therefore, be closely involved in the sinking and management, such that conflicts do not arise among marine resource users.

Notes: 6281

'File' Attachments: <internal-pdf://28495-16219-1-PB-1630497792/28495-16219-1-PB.pdf>

Language: English

Reference Type: Thesis

Record Number: 282

Author: S. Mangi

Year: 2006

Title: Assessment of the Status and Management of Kenya's Coastal Fisheries

Degree: PhD

Number of Pages: pp. 33-68

Thesis Type: PhD Thesis

Short Title: Assessment of the Status and Management of Kenya's Coastal Fisheries

Keywords: Artisanal fishing | Beach seines | Catch composition | Depleted stocks | Fishery management | Fishery surveys | Fishing | Fishing gear | Gillnets | Line fishing | Mesh regulations | Overexploitation | Overfishing | Article Geographic Terms ISW, Kenya, Coast

Abstract: Fish catches from Kenya's reef lagoons landed by artisanal fishers using six types of gear - large and small traps, gill nets, beach seines, hand lines and spear guns - were studied from nine fish landing sites over a five year period to describe temporal patterns and assess the state and management of the fishery. Catch composition for each site, gear and year was quantified using the number of individuals and species caught, species diversity, fish size and mean trophic level of species. Participatory fishing surveys were used to map out the actual sites fished. Results indicate consistency in the actual sites fished, number of individuals and species caught, fish size, mean trophic levels and gear selectivity over time. Beach seines and small traps consistently landed a high number of individuals than most other gears and were also associated with the smallest-sized individuals throughout the study. Beach seines also consistently caught the highest number of species (14 ± 5 species per man per day) while hand lines were associated with the highest mean trophic level of species (3.5 ± 0.1). Catches in small traps were the least diverse (Simpson's Index = 0.7) in species throughout the study. Combined data for all gears and sites show stagnating catches over time, decreasing frequency of larger fish in catches, and consistently low mean trophic levels of species indicating that the reefs are being overexploited. Results suggest that the potential to overfish the reefs is higher with

beach seines due to their small mesh sizes than by the other gears. Some of the management options that have been adopted to prevent overexploitation of the reef resources are discussed. It is concluded that the effective management of Kenya's fisheries will continue to be challenging as the set gear restrictions and mesh size regulations are not enforced.

Notes: 6282

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Thesis

Record Number: 283

Author: S. C. Mangi

Year: 2006

Title: Financial Comparisons of Artisanal Fishing Gears Used in Kenya's Coral Reef Lagoons IN: Gear Management in Kenya's Coastal Fisheries

Degree: PhD

Number of Pages: pp. 136-164.

Thesis Type: PhD Thesis

Short Title: Financial Comparisons of Artisanal Fishing Gears Used in Kenya's Coral Reef Lagoons IN: Gear Management in Kenya's Coastal Fisheries

Keywords: Fishing, gears, cost

Abstract: The cost of fishing and income earned by fishers using small and large traps, gill nets, beach seines, hand lines and spear guns were assessed in the multi-gear fishery of southern Kenya to establish a financial rationale for gear use. Direct observations and key-informant interviews with fish leaders and boat captains were used to gather data on the type and number of gears used, the cost of gears, boats and repairs, and the price for fish. Where the cost could not be quantified, a qualitative assessment was used to rank costs collected at each landing site between 2003 and 2004 and used to calculate the financial returns for each gear. Results indicate that spear guns and beach seines had the lowest per capita capital investment among the gears. Most fishers do not need to pay anything for the use of a beach seine and need only Ksh 300 (or US\$ 4) to buy a spear gun, while they need to invest Ksh 25,000 (or US\$ 333) for purchase and use of gill nets. There were differences in financial returns among the gear types with spear guns, gill nets and hand lines showing higher returns (above Ksh 200 or US\$ 3 per day) while the rest of the gears less than 180 (or US\$ 2 per day). All gear types were profitable, although relative profitability was higher with spear guns, gill nets and hand lines and low with small traps big traps and beach seines. Correlation of the financial measure for each gear to four categories of damage to fish and habitats measured by the proportion of juvenile fish, discards, coral damage per unit catch and area showed that the low cost gears (spear gun and beach seine) were associated with highest environmental damage indicating complex implications for fisheries management. These gears are usually the entry point of many poor young fishers to the fishery who want to earn a living. For this reason, it is going to be difficult to control the use of destructive fishing gears. Establishing collaborative management programmes that involve participation of the fishers in fisheries management could provide a mechanism for discussions and implementation of gear exchange programmes.

Notes: 6283

'File' Attachments: internal-pdf://i0044-7447-36-8-671-1329665796/i0044-7447-36-8-671.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Thesis

Record Number: 284

Author: S. C. Mangi

Year: 2006

Title: Factors Influencing Fish Catch levels on Kenya's Coral reefs

Degree: PhD

Thesis Type: PhD Thesis.

Short Title: Factors Influencing Fish Catch levels on Kenya's Coral reefs

Keywords: Fishing, Catch, gears, biomass

Abstract: The factors influencing fish catch levels on Kenya's coral reefs were studied to determine which are the most significant. Catch data were collected both at the family level by measuring the wet weight of catch, and at the species level by counting the number of fish landed at each landing site of each fishing ground. Live coral cover, topographic complexity, fish biomass and density, sea urchin biomass and density, and the number of fishers, boats and gear used in each fishing ground were estimated and compared to the catch data. Studied fishing grounds included one location where only basket traps were allowed, six locations where all gears types were used except beach seines, and four locations where all types of gear including beach seines were used. Catch levels, fishing effort and habitat parameters significantly differed (one-way ANOVA, $p < 0.05$) among the fishing grounds and gear regimes. The location fished by traps only had the highest catch (4 ± 1.6 kg/man/day), fish biomass (559 kg/ha) and live coral cover (12.4%). Catch levels were positively correlated with the number of fishers but not with the number of gears deployed or boats. Univariate correlations between catch and underwater population density for the 10 most common fish species in catches showed significant (one-way ANOVA, $p < 0.001$) relationships for seven of them. Multiple regression analysis suggests that the number of fishers was the single strongest factor determining total catch levels. However, catch data collected at the species level, suggest that the fishing effort interacts with fish density to influence catch. Most of the fishing grounds studied appeared to be under high pressure due to destructive fishing methods and high fishing effort, and showed signs of over use. The restrictions on gears and number of fishers at one site appeared to result in higher catches, percentage coral cover and fish biomass. These results indicate that for gear restrictions to be effective in improving fish catches, the number of people fishing should also be controlled. Ways to reduce fishing effort, eliminate destructive fishing gear, protect vulnerable species and reduce sea urchins should be encouraged to rectify the problem of overfishing.

Notes: 6284

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Thesis

Record Number: 285

Author: S. C. Mangi

Year: 2006

Title: Gear Management in Kenya's Coastal Fisheries

Degree: PhD

Thesis Type: PhD Thesis

Short Title: Gear Management in Kenya's Coastal Fisheries

Keywords: Fishing gears, species diversity, management, catch

Abstract: The fishing gears used, their impacts on species diversity and structure of marine communities, and their relative profitability were studied in the multi-gear fishery of southern Kenya to develop policy recommendations for the management of this artisanal fishery. Catch data for each gear were collected from nine fish landing sites over a five-year period and analysed in order to describe temporal patterns in gear use and to assess the state and management of the fishery. Benthic substratum damage, proportion of juvenile fish and discards were quantified and these data were used to evaluate the impacts of each gear on coral reef biodiversity. The impacts of each gear were later compared to the profitability for each gear to establish the motivation behind using more damaging gears. Relationships between catch, fishing effort, habitat variables and communities from specific grounds were explored in order to determine significant variables influencing fish catch levels. Results indicate that the fishery is overexploited and many species are growth overfished. Among the gears, bench seines cause the highest damage to fish and habitats and have the potential to overfish the reefs. Low cost gears were associated with highest environmental damage indicating that the need for cheap gears drives fishers to using more damaging gears. The number of fishers was the strongest factor influencing fish catch levels, and there was evidence that the present fishing effort is very high. Evaluation of the problem of overfishing and use of destructive gear using the Driver-Pressure-State- Impact-Response (DPSIR) conceptual framework showed that increasing human population and deepening poverty are some of the socio-economic drivers creating pressures on the reefs. Consequently, strategies to alleviate poverty among fishers should be sought, Specific gear management issues are discussed. To be sustainable, the Kenyan artisanal fishery will require a combination of gear, area, time, size, species and effort restrictions.

Notes: 6285

'File' Attachments: internal-pdf://Mangi_PhD-4217550593/Mangi_PhD.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Thesis

Record Number: 286

Author: S. C. Mangi

Year: 2006

Title: Quantifying the Environmental Impacts of Artisanal Fishing gears on Kenya's coral reef ecosystems

Degree: PhD

Number of Pages: pp. 69-105

Thesis Type: PhD Thesis

Short Title: Quantifying the Environmental Impacts of Artisanal Fishing gears on Kenya's coral reef ecosystems

Keywords: Environmental impacts, fishing gear, catch, coral reef

Abstract: The environmental impacts of artisanal fishing gear on coral reef ecosystems were studied in the multi-gear fishery of southern Kenya to evaluate which gear types have the greatest impact on coral reef biodiversity. The gears studied were large and small traps, gill nets, beach seines, hand lines, spears and spear guns. Lengths at maturity for all of the species in the catches from each gear type were used to calculate the proportion of juvenile fish, and the size and maturity stage at first capture. Apart from discarding 6.5% of their daily catch in the sea, as it was too small, beach seine fishers also landed the highest percentage of juvenile fish ($68.4 \pm 15.7\%$), a proportion significantly higher (one-way ANOVA, $p < 0.001$) than in any other gear. Catches from hand lines were also associated with a very high proportion of juvenile fish ($55.6 \pm 27.2\%$). Interactions between fishers, their gear and live corals were quantified from direct observations of fishing activities and used to calculate the number of coral contacts based on catch and area fished. Spear fishers had the most contacts with corals per unit catch (12.6 ± 1.8 coral contacts per kg per trip) while on a per area basis, it was spears, gill nets and beach seines that showed the highest number of coral contacts. Results indicate that use of these three gears cause the most direct physical damage to corals. Field assessment of levels of coral density for fishing grounds under three gear regimes: traps only, no beach seines and all gear types showed that coral density and size of coral colonies were significantly lower (two-way ANOVA, $p < 0.001$) in sites with all gear types than in sites under the other gear regimes. Ordination of study sites using non-metric multidimensional scaling for mean coral densities and size of coral colonies showed close similarity between sites where beach seines had been eliminated and regulations enforced, while sites where beach seines were eliminated and regulations poorly enforced closely relating to the sites that were still under beach seine use. These results are indicative of the need to enforce fishing gear regulations. The study suggests that measures to protect spawning stock biomass of the exploited populations, enforcing mesh size regulations and reducing the use of beach seines would help in the long-term sustainability of the fishery and maintain reef biodiversity.

Notes: 6286

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 287

Author: B. Kaunda-Arara and G. A. Rose

Year: 2004

Title: Homing and site fidelity in the greasy grouper *Epinephelus tauvina* (Serranidae) within a marine protected area in coastal Kenya

Journal: Marine Ecology Progress Series

Volume: Vol. 277

Pages: pp. 245-251

Short Title: Homing and site fidelity in the greasy grouper *Epinephelus tauvina* (Serranidae) within a marine protected area in coastal Kenya

Legal Note: Kenya

Keywords: Homing, groupers, Malindi

Abstract: Homing ability and site-fidelity in the greasy grouper *Epinephelus tauvina* (Serranidae) were studied at Malindi Marine Park (6.3 km super(2)), coastal Kenya, from January to April 2002 using acoustic telemetry. Displacement experiments involving 12 groupers (mean size 57.9 cm) from multiple capture sites resulted in a 67% homing success. Upon release at displacement sites (0.5 to 2.6 km from the point of capture), most initial movements were small-scale and non-directional. Neither the tidal range nor time of day influenced the magnitude of these daily movements. Returns to the capture sites were sudden, occurring predominantly (88%) on spring tide dates. Fish displaced at the spring tide returned to capture sites faster (8.6 d) than those displaced at the neap tide (14.3 d). Time taken to return to capture sites ranged from 4 to 19 d (mean 9.6 d) and was not correlated with distance of displacement. However, time taken for the fish to home was negatively correlated with tidal range at displacement. Home ranges established after homing (0.07 to 0.73 km super(2)) were stable and negatively correlated with fish size, suggesting an ontogenetic shift in home range development.

Notes: 6287

'File' Attachments: <internal-pdf://m277p245-3519993856/m277p245.pdf>

Language: English

Reference Type: Book Section

Record Number: 288

Author: B. Fulanda

Year: 2003

Title: Shrimp Trawling in Ungwana Bay A Threat to Fishery Resources

Book Title: Recent advances in coastal ecology

Number of Volumes: no. 70.

Pages: pp. 233-242.

Series Editor: R. a. i. c. ecology:

Short Title: Shrimp Trawling in Ungwana Bay A Threat to Fishery Resources

Section: Kenya

Keywords: Ungwana Bay, trawling, by-catch

Abstract: This paper examines the landings of three trawlers fishing the Ungwana Bay (Kenya) over a seven day period totalling about 200 hrs fishing time. A critical analysis is made of the catch and its composition in terms of marketable catch (target species and commercial fish) and bycatch (non-commercial, juveniles and debris). Prawns made up 13.7% of the catch while commercial fish amounted to 14.4% of the total. The remainder (71.9%) comprised of bycatch. Further breakdown showed that non-commercial fish made up the bulk of the by-catch with 42.9%. This group included Branchyura, Apogonidae, Leiognathidae, Squillidae and Gobiidae families. Juveniles accounted for 23.6% of the by-catch. The latter consisted for almost two-thirds of juveniles of commercial fish among which Ariidae were the commonest. Other families included Atherinidae and Carangidae. In the shallow 'Kipini' area, trawling does considerable damage to the benthic fauna and flora. The trawling attracts a large population of piscivorous birds creating artificial and unstable food webs. A Turtle Excluder Device (Anthony

Weedless) was used on one of the trawlers but it appeared to result in lower catch of commercial fish allowing only small species and undersized fish into the cod end. It is concluded that the trawlers pose a threat to both the Ungwana fishery and other marine resources.

Notes: 6288

'File' Attachments: internal-pdf://Ungwana2002-4083068416/Ungwana2002.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 289

Author: S. Mangi and T. R. McClanahan

Year: 2003

Title: The Effect of a Marine Protected Area and the Exclusion of Beach Seines on Coral Reef Fisheries

Book Title: Recent Advances in Coastal Ecology; Studies from Kenya

Number of Volumes: 70.

Pages: 171-184.

Series Editor: R. a. i. c. ecology:

Short Title: The Effect of a Marine Protected Area and the Exclusion of Beach Seines on Coral Reef Fisheries

Section: Kenya

Keywords: Fish catches, beach seine, Kenya

Abstract: Fish landing data from adjacent the Mombasa Marine National Park (MNP) and seven sites in Diani (Kenya) were studied from 1995 to 1999 to determine the influence of the park and restrictions of beach seines on fisheries catches. Data were based on sampling for 10 days per month, where fish were separated into the major families, the wet weights estimated by a spring balance, and data analysed based on gear, numbers of fishers, and the area from which the fish were caught. In the case of the Mombasa marine reserve, the beach seine exclusion was done nearly simultaneously with a reduction in the size of the Marine Protected Area. These two factors combined resulted in increased fish catches on a per area and fisher basis. It was, however, difficult to distinguish the effects of the two changes, but the initial pulse (< 6 months) in catch is largely due to opening a previously unfished area to fishing. After the large initial increase in the catch there was a decline over time, but catches were still above those before the management changes. In Diani the two landings that restricted beach seines for over 20 years had the highest per fisher catches, being 13% greater than sites with beach seines, while those that still adopt beach seines had the lowest catches (ANOVA, $F = 4.5$). Data shows a progressive decline in per man catches in all the sites irrespective of the management in place or the exclusion of the beach seines. Nevertheless, the marine reserve had the highest catch per area (5.5 kg/ha) despite having the highest number of fishers per area basis ($7 \sim 2$ fishers/ha/month). There were no strong seasonal patterns from time series plots for the catch statistics. We show that parrotfishes (Scaridae), rabbitfishes (Siganidae), scavengers (Lethrinidae and Lutjanidae) and octopuses (Octopoda) are the major groups dominating these fisheries.

Notes: 6289

'File' Attachments: internal-pdf://ASC-1253933-067[1]-2414492416/ASC-1253933-067[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article

Record Number: 290

Author: S. E. Micheni

Year: 2008

Title: The effects of water pollution on fisheries and man.

Magazine: Samaki News

Place Published: FD, KMFRI

Publisher: FD

Volume: 2

Issue Number: 1

Pages: 28.

Short Title: The effects of water pollution on fisheries and man.

Abstract: Water pollution is generally defined as the introduction of foreign substances into marine and fresh water environments, which results in deleterious effects as harmful to marine activities including fishing, impairment of quality for the use of water and reduction of amenities. Inland waters are now recognized as a source of great potential for increasing the world's fish harvest. Aquaculture located in rivers, lakes, reservoirs and dams play an important and expanding role in production of fish for food. The pressures and risks of water bodies are many. Freshwater fisheries suffer as a result of many factors including lowering of the lake level waters, canalization of rivers, drainage of wetlands, water diversion and siltation. Vast tracts of wetlands drained for farming have destroyed fish for breeding and spawning habits causing a loss in fish production. Practices such as graveling dredging, overgrazing and siltation have damaged fishing areas are evident in Lake Baringo. The quality and quantity of fish production is affected directly and indirectly by the presence of pollutants.

Notes: 6290

'File' Attachments: internal-pdf://28-3244681217/28.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 291

Author: B. M. Mwashote

Year: 2003

Title: Levels of Cadmium and Lead in Water, Sediments and Selected Fish Species in Mombasa, Kenya.

Journal: Western Indian Ocean Journal of Marine Science

Volume: 1

Issue: 2

Pages: Pg. 25-34

Short Title: Levels of Cadmium and Lead in Water, Sediments and Selected Fish Species in

Mombasa, Kenya.

Legal Note: Kenya

Keywords: Heavy metals, fish species, sediments, Makupa Creek

Abstract: Flame absorption spectrophotometry was used to investigate the concentration and distribution of cadmium and lead in water, sediments and selected fish species in Makupa and Tudor creeks in Mombasa, Kenya between May 1997 and March 1998. The results were compared with those obtained in relatively less anthropogenically influenced areas along the Kenyan coast. The mean concentrations for Pb ranged from not detectable (nd) to 0.012 mg/l, 0.2 to 58.0 mg/kg and nd to 59.3 mg/kg in water, sediment and fish samples respectively. Cadmium concentrations in water were generally below detection limits, while in sediment and fish samples, they ranged from nd to 1.0 mg/kg and nd to 3.7 mg/kg respectively. Overall, Pb and Cd concentrations were low in the water column of Makupa and Tudor creeks, with a few incidents of elevated levels in sediments and some fish species, especially during the rainy season. Makupa creek had the higher levels overall. The levels of Pb and Cd in most of the fish species analyzed were generally within acceptable limits by FAO standards.

Notes: 6291

URL: ajol.info/index.php/wiojms/article/view/28426/22074

'File' Attachments: internal-pdf://28426-33120-1-PB-3459873793/28426-33120-1-PB.pdf

Language: English

Reference Type: Magazine Article

Record Number: 292

Author: P. M. Nzungi

Year: 2008

Title: National fish production updates.

Magazine: Samaki News

Place Published: FD, KMFRI

Publisher: FD

Volume: 2

Issue Number: 1

Pages: 33-34

Short Title: National fish production updates.

Abstract: Kenya produces fish from two major sources namely capture and aquaculture fisheries. Capture fisheries covers fresh water lakes, rivers, dams and marine waters of the Indian Ocean and accounts for the bulk of the production. The rest of the production is sourced from fish farming activities in both fresh and marine waters. In the year 2001, the country's fish nominal production amounted to 164276 tons Capture fisheries contributed 99.4% and aquaculture 0.6% of the total nominal catch. Like in the past years, in the fish from freshwater ecosystems dominated the nominal catch with a contribution of 157810 tons (96.1%) of the total catch. Marine waters contributed the remaining 6466 tons 3.9% of the catch. For the last three years, freshwater catches has averaged at 193870 tons per year while marine catches were more or less were constant at between 4700 and 6500 tons with the ex-vessel value being dictated by the quantity of fish landed and demand for each particular species. In the year 2001, national fish production declined by 18.9% compared to the year 2000 catch of 202639 tons.

This decline in nominal production was accompanied by a mere 0.6% decline in ex-vessel value amounting to 46.6 million shillings. The small decline in value compared to the large decline in fish production could be attributed mainly to high prices offered for Nile perch (*Lates niloticus*) by fish processors, which alone contributed 47.8% of the country's total annual production. The average ex-value price for this particular species from Lake Victoria increased from 51.62 shillings per kg in 2000 to 69.02 in the year 2001. Artisanal fishermen harvested over 90% of the fish in the country. The rest was by commercial fishermen who mainly trawl for crustaceans in the Indian Ocean. The commercial fishermen target crustaceans but get small quantities of fish as by-catches. It is estimated that the average 193000 tons total annual fish production directly earned the fishermen around 8000 million shillings.

Notes: 6292

'File' Attachments: <internal-pdf://33-1365691137/33.pdf>

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 293

Author: J. Rasowo and T. Kombo

Year: 2003

Title: Mangrove-Friendly Aquaculture Development of Silvofisheries in Kenya

Book Title: Recent advances in coastal ecology

Volume: no. 70.

Pages: 371-376

Short Title: Mangrove-Friendly Aquaculture Development of Silvofisheries in Kenya

Section: Kenya

Keywords: Silvofisheries, aquaculture, mangroves

Abstract: The mangrove ecosystem has traditionally provided physical advantages for aquaculture development and has usually attracted individuals and corporations eager to invest in aquaculture with the tacit approval from the local governments. The Kenya government has made an unsuccessful attempt at developing the coastal aquaculture through promoting pond shrimp culture in the mangroves. There is now growing awareness of the environmental degradation of the mangrove ecosystem as a result of pond shrimp culture and the resultant deprivation, displacement and marginalization of mangrove based communities. This paper reviews some factors which may have been responsible for the non-growth of aquaculture at the Kenyan coast. It further discusses the introduction of silvofisheries, a non-destructive mangrove-friendly aquaculture technology as an alternative method in the effort towards promotion of coastal aquaculture in Kenya.

Notes: 6293

'File' Attachments: [internal-pdf://ASC-1253933-067\[1\]-2168198145/ASC-1253933-067\[1\].pdf](internal-pdf://ASC-1253933-067[1]-2168198145/ASC-1253933-067[1].pdf)

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 295

Author: J. G. Tunje and J. Hoorweg

Year: 2003

Title: Awareness of Resource Degradation among Artisanal Fishers in Kilifi and Lamu

Series Title: Recent advances in coastal ecology

Volume: no. 70.

Pages: pp. 185-200.

Publisher: A. S. Centre

Type: Research report

Short Title: Awareness of Resource Degradation among Artisanal Fishers in Kilifi and Lamu

Keywords: Coral reef degradation, Kilifi, Lamu,

Abstract: The study was carried out in Kilifi (including Malindi) and Lamu Districts of Kenya, focusing on the activities of artisanal fishermen. The fishing methods that the fishermen use and the extent they contribute to coral reef degradation were the major study objective. The fishing methods used, factors for their choice, and their perceived impact on coral reefs were investigated. Indigenous environmental conservation efforts, fishermen's alternative source of income, and attitudes towards environmental conservation were also examined. Fishermen mainly use the gear they have experience with and gear that brings them high catches. They did not consider the environmental impacts of the gear they used. The results also revealed that there were few signs of indigenous marine conservation in this part of the coast. Half of the fishermen interviewed observed certain cultural restrictions relating to personal safety at work, good hygiene and fish handling. The other half did not. Finally, local fishermen are willing to initiate and participate in programmes of marine environmental conservation aimed at the fishery resource as long as it enables them to improve their incomes.

Notes: 6295

'File' Attachments: internal-pdf://ASC-1253933-067[1]-2456513280/ASC-1253933-067[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 296

Author: M. L. Dishon and K. M. Mavuti

Year: 2001

Title: The biology and fishery of the *Plectorhinchus* spp. along the Kenyan marine inshore waters

Conference Name: 2nd Western Indian Ocean Science Association (WIOMSA) Scientific Symposium -

Publisher: WIOMSA

Pages: pp. 43-44.

Type: Book of Abstracts

Pub Place: Kenya

Keywords: *Plectorhinchus*, Catches, seasonality

Abstract: Studies on 63 samples of fish of the genus *Plectorhinchus* have shown that this fish species exhibits variations in its contribution to the total catches. The current catches have few specimens of any of the three species of the genus *Plectorhinchus* namely *P. flavomaculatus*, *P.*

schotaf; *P. gaterinus*. The major species consists of *Plectorhinchus flavomaculatus*, which accounts for 40 % of the samples, *Plectorhinchus schotaf* 35 % of the samples while *Plectorhinchus gaterinus* contributes the remaining 25%. Fish weighing up to 2 kilograms have been recorded in the samples with the mean weight being 500 g (0.5 kilograms). Fish of 60 cm in length have been recorded in literature although observations from the field have shown samples weighing up to 1200 cm (1.2 meters). No fish has been found to have mature gonads, which could mean that this fish exhibit seasonal spawning which, could be highly correlated to the monsoon. There is a significant deviation of the sex ratio from 1:1 in favour of the females. Gonads of the samples collected so far show a majority of fish at stage II according to the classification of Dadzie (1974) and Nzioka (1979). The fish species constitutes a significant portion of the catch in the months preceding the North East monsoon (March to August). In all the stomachs examined for the species there is a dominance of crustaceans, which could be an indication of abundance of this group in the benthos as well as selective feeding. Occurrence of sand in all the guts examined indicates that the fish actively predate on bottom dwelling organisms. An interesting observation is that above a critical size of 23 cm the stomach contents are indistinguishable, which could be explained by the fact that this fish have pharyngeal teeth, which crush all food material before it, enters the oesophagus.

Notes: 6296

Last Modified Date: Emmanuel Mmbaru

Language: English

Reference Type: Conference Paper

Record Number: 297

Author: B. M. Fulanda and H. Motong'wa

Year: 2001

Title: Bottom shrimp trawling in Malindi: a preliminary survey of its impact on the artisanal fishery

Conference Name: 2nd Western Indian Ocean Science Association (WIOMSA) Scientific Symposium -

Publisher: WIOMSA

Pages: p. 37.

Type: Book of Abstracts.

Pub Place: Kenya

Abstract: The paper analysis data from the Ungwana bay fishery, Kenya over a period of one year from June 1999, assessing the impacts of bottom shrimp trawling on the socio-economics of the artisanal fishery in Malindi. This was prompted by increased conflicts in the fishery and aimed at developing sustainable resource harvest strategies. In the artisanal fishery, 15 landing beaches were sampled in the trawled grounds of the bay. Five main beaches were identified as Mayungu, Malindi, Ngomeni, Kenyaole, and Mto-Kilifi. One beach in non- trawled area was chosen at Watamu. Data collection was done by use of questionnaires all the stakeholders i.e. Fisheries officers, cooperatives, fishermen etc. Boats in this fishery average less than or equal to 60 HP with majority depending on sails/oars for propulsion. Gears employed are vast, changing with season. Gillnets however dominate. Attitude towards trawling in beaches bordering the "Malindi shallow" trawl area were highly negative (Malindi-(89% and Ngomeni-78%). Fish

landings from this area are on the decline. Destruction of fishermen's' gears and boats is common in this area, with "unmarked" driftnets set in the sub-surface waters being most affected. In Ngomeni, this occurred during trawlers' entourage for Kipini. In conflict prone areas of Malindi and Ngomeni, the variety of gears, fishing methods and income diversification is high. The entry of migratory fishermen (Pemba Somali) with more powerful vessels affected conservation attitudes in these beaches prompting use of destructive methods by the locals. Data from the trawlers, which average 650HP in this bay showed that fish landings outweighed the targeted prawns and an overall decline in catch was also noted with large amount of trash being discarded at sea. It's concluded that bottom shrimp trawling has a negative impact on the development of this artisanal fishery and is a threat to the survival of these coastal communities.

Notes: 6297

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 298

Author: A. O. Muohi, J Mavuti, KM Omondi, JM

Year: 2001

Title: Occurrence of heavy metal pollutants in sediments and fish in Port Reitz, Mtwapa and Shirazi marine tidal creeks along the Kenyan coast

Conference Name: 2nd Western Indian Ocean Science Association (WIOMSA) Scientific Symposium

Publisher: WIOMSA

Pages: p. 68.

Type: Book of Abstracts

Pub Place: Kenya

Keywords: Heavy metals, sediments, fish species

Abstract: Mombasa Island is situated at latitude 4°05' S and longitude 39.65° E along the Indian Ocean coast of Kenya. The Reitz-Kilindini creek complexes situated on the westerly and southwesterly boundaries of Mombasa Island are presumed contaminated with both inorganic and organic anthropogenic inputs of industrial and sewage disposal respectively. Mtwapa creek located about 5km north of Mombasa town, is presumed contaminated mainly with inorganic inputs while Shirazi creek situated 70km south of Mombasa, is presumed relatively unpolluted. Sediments and fish samples from various stations within the three sites were collected between the month of January and March 2001. Fifty five sediment samples were digested using hydrochloric acid and hydrogen peroxide while fish muscle tissues of individuals from 17 fish species were digested using nitric and sulphuric acids plus hydrogen peroxide. Copper, zinc, lead and cadmium elemental concentrations were assessed by atomic absorption spectrophotometry. The method of analysis was validated using IAENSOIL-7, MA-M-2 (Mussel tissue) and MA-A-2 (Fish homogenate) International Atomic Energy Agency certified reference materials. In sediments, copper (Cu) concentrations ranged from 1.983 µg/g to 79.634 µg/g, zinc (Zn) ranged from 8.180 µg/g to 92.664 µg/g, lead (Pb) ranged from

7.748 $\mu\text{g/g}$ to 97.326 $\mu\text{g/g}$ while cadmium (Cd) ranged from 0.302 $\mu\text{g/g}$ to 4.727 $\mu\text{g/g}$. In fish, Cu ranged from no detection (NO) to 1.903 $\mu\text{g/g}$, Zn ranged from NO to 11.756 $\mu\text{g/g}$, Pb ranged from NO to 4.812 $\mu\text{g/g}$ while Cd ranged from NO to 0.894 $\mu\text{g/g}$. There was significant variation in the elemental concentrations in sediments between and within sites. Similarly, in fish there was significant variation in elemental concentration between sites, species and individuals. All p-values with respect to these variations were < 0.05 .

Notes: 6298

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 299

Author: J. W. Mwaura, I Obura, D.

Year: 2001

Title: Reef fisheries status and site use by fishermen in Diani, Kenya

Conference Name: 2nd Western Indian Ocean Science Association (WIOMSA) Scientific Symposium

Publisher: WIOMSA

Pages: pp. 47-48

Type: Book of Abstracts

Pub Place: Kenya

Abstract: The Diani-Chale artisanal coral reef fishery is facing increasing threats from overexploitation and destructive fishing practices that cause severe degradation of the reef ecosystem and negatively affect livelihoods of fisher communities in the area. This study sampled various shallow traditional fishing sites (2-4m at low tide) within the Diani-Chale reef lagoon that are subjected to different fishing gears and intensity of use, to determine their effects on reef fisheries production. In-water data collection focused on benthic cover, sea urchin density and fish abundance, the last two using fisher-data collectors and local taxon names to correspond to an ongoing catch monitoring programme. Parallel to this, informal interviews were held with fishers to assess how fishers' preference for certain gears and sites related to actual resource levels and reef health. Preliminary results indicate that seine net fishing is associated with destruction and alteration of reef fish habitats, and low reef community population sizes and diversity. This corresponds with local fishers' perceptions that see this method is the major factor causing reductions in reef fish populations, as reflected by catch data and underwater fish counts. Due to the wide diversity of gears used at most reef sites, and the long history of heavy exploitation in the area, other patterns of habitat health, fish abundance and use patterns are weak. Localized initiatives such as sea urchin reduction on the scale of small patch reefs (20-30 m across) are not yet showing benefits to reef fish catch, 9 months following sea urchin reduction. Preferred fish targeted by fishermen correspond to numerical dominance in catch records, and are determined by preferred gear and the site fished, over any particular taxon preference. Within this, the fish catch amount and composition is influenced largely by weather and season, fish migrations in and out of the reef, fishing site features, and to some extent the market.

Notes: 6299

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 300

Author: J. A. Nyunja and K. M. Mavuti

Year: 2001

Title: Trophic ecology of juvenile planktivorous fishes in Mtwapa creek and Wasini channel of the Kenyan coast

Conference Name: 2nd Western Indian Ocean Science Association (WIOMSA) Scientific Symposium

Publisher: WIOMSA

Pages: p. 33.

Type: Book of Abstracts

Pub Place: Kenya

Keywords: Fish species, diet

Abstract: The diets and prey selection of 603 juvenile marine fishes belonging to 5 families and 8 species (the clupeids *Sardinella gibbosa*, *Spralellalides delicalulus* and *Pellana dilchella*, the atherinid *Alherinomorus lacunosus*, the gerreid *Gerres oyena*, the carangid *Selar crumenaphthalmus* and the leiognathids *Securor insipidas* and *Leiognathus equula*) were examined from Mtwapa Creek. The diets of *S. gibbosa* and *A. lacunosus* caught from Mtwapa Creek and Wasini channel were compared to investigate whether there was any spatial difference in their diets. Percentage abundance (%N) and percentage occurrence (%F) dietary data are presented by Costello graphical method, such that prey importance (dominant or rare) and fish-feeding strategy (specialist or generalist), is visually apparent. All the fish species examined did not show any clear signs of specialization in their feeding strategy. Copepods were the most important zooplankton prey of all the species except in *S. crumenaphthalmus* whose diet was mainly composed of nematodes (%N=21, %F=56). The diets of these fishes were compared to the zooplankton available in the sampling areas. Prey selection by *S. gibbosa* and *A. lacunosus* was density-dependent for all common prey types encountered in the zooplankton samples. Taxa that were rare in the plankton were even rarer in the diet. However, some taxa were present in the diet of these fish but lacking in the plankton samples. This suggests that the migratory patterns of these schooling fishes may also influence their dietary composition. The size of prey eaten did not differ greatly between these species of fish. There was a significant relationship between fish length prey width.

Notes: 6300

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 301

Author: A. N. Otieno, K. M. Mavuti and E. Wakwabi

Year: 2001

Title: A survey of the artisanal fisheries of Shirazi and Shimoni, South Coast, Kenya

Conference Name: 2nd Western Indian Ocean Science Association (WIOMSA) Scientific Symposium

Publisher: WIOMSA

Pages: p. 44.

Type: Book of Abstracts

Pub Place: Kenya

Keywords: Reef fishes, MPA, gear

Abstract: The occurrence of fishes in coral reefs seem to dominate over occurrence in sea grass beds and mangroves. This has affected the artisanal fisheries of, Shirazi and Shimoni in South Coast, Kenya. Fishers seem to concentrate on the dominant coral reefs in Shimoni, although the influence of Kisite- Mpunguti Marine Park and Reserve cannot be overlooked. Fishing grounds appear to be concentrated along the marine reserve boundary. Traditional fishing gear is the norm and at this point in time, is dominated by traps (malemas), hooks and lines, (mishipi) and to a less extent, nets (nyavu) (ranging from 2.5"- 12.0" mesh size). Fishing vessels are dominated by dug-out canoes (dhows) and outrigger canoes (ngalawa), operated by about one hundred twenty (120) fishermen. Fish specimens collected so far from the experimental fishing surveys from the Shimoni fishery indicate Scariidae (mainly *Leptoscarus* spp. and *Scarus* spp.), Labridae, Acanthuridae, Lethrinidae, Chetodontidae, Pomacentridae, Siganidae, Balistidae etc. respectively, dominate. These families appear to be the most common families in the fishery based on population densities at this point in time. Other landings include octopuses (Octopodidae) and squids (Sepiidae). Data collection is continuing. Analysis of fish catches is being done in relation to (1) species composition, (2) length-weight relationships and condition factor, (3) length-frequency (4) catch per unit effort (CPUE), and (5) social economic parameters. One kilogram of fish currently stands at Kshs 70-80). Fishing activities follow the lunar cycle, which in turn affects tidal fluctuations. Fishermen set out to fish at low tide and come back with the flooding tide, mostly from very early in the morning (as early as 4.00 a.m.) to the afternoons (approx. 5 not equal to 2 hrs). The Shirazi fishery follows the same pattern. Enough data for description and comparison from the fish populations in the three ecotypes for diversity indices is yet to be achieved. The current refugee influx in Shimoni has adversely affected artisanal fisheries in this area.

Notes: 6301

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 302

Author: T. R. McClanahan, V. Hendrick, M. J. Rodrigues and N. V. C. Polunin

Year: 1999

Title: Varying responses of herbivorous and invertebrate-feeding fishes to macroalgal reduction on a coral reef.

Journal: Coral Reefs

Volume: 18

Pages: 195-203.

Short Title: Varying responses of herbivorous and invertebrate-feeding fishes to macroalgal

reduction on a coral reef.

Legal Note: Kenya

Abstract: The consequences of macroalgal overgrowth on reef fishes and means to reverse this condition have been little explored. An experimental reduction of macroalgae was conducted at a site in the Watamu Marine National Park in Kenya, where a documented increase in macroalgal cover has occurred over the last nine years. In four experimental 10 m by 10 m plots, macroalgae were greatly reduced (fleshy algal cover reduced by 84%) by scrubbing and shearing, while four similar plots acted as controls. The numerical abundance in all fish groups except wrasses and macroalgal-feeding parrotfishes (species in the genera *Calotomus* and *Leptoscarus*) increased in experimental algal reduction plots. Algal (*Sargassum*) and seagrass (*Thalassia*) assays, susceptible to scraping and excavating parrotfishes, were bitten more frequently in the algal reduction plots one month after the manipulation. Further, surgeonfish (*Acanthurus leucosternon* and *A. nigrofuscus*) foraging intensity increased in these algal reduction plots. The abundance of triggerfishes increased significantly in experimental plots relative to control plots, but densities remained low, and an index of sea urchin predation using tethered juvenile and adult *Echinometra mathaei* showed no differences between treatments following macroalgal reduction. Dominance of reefs by macro-fleshy algae appears to reduce the abundance of fishes, mostly herbivores and their rates of herbivory, but also other groups such as predators of invertebrates (triggerfishes, butterflyfishes and angelfishes).

Notes: 6302

'File' Attachments: internal-pdf://McClanahan3-3473518848/McClanahan3.pdf

Language: English

Reference Type: Thesis

Record Number: 303

Author: E. O. Wakwabi

Year: 1999

Title: The diets of juvenile fishes in a tropical mangrove bay, Gazi Bay, Kenya

City: Ghent Rijksuniv., Belgium

University: Ghent Rijksuniv

Degree: PhD

Number of Pages: pp. 119-156.

Thesis Type: PhD Thesis.

Short Title: The diets of juvenile fishes in a tropical mangrove bay, Gazi Bay, Kenya

Keywords: Fish, community, seagrass, Kenya

Abstract: The diet of 1182 fishes were abundant in the beam trawl catches from Gazi bay, Kenya are discussed. Most of these were juveniles of 33 species representing 16 teleost families. 75% of the gutted specimens (belong to 10 species) were investigated for seasonal and size related changes in diets. The stomach fullness index (F.1.) was generally very low and the stomach contents were at a very advanced state of digestion. The most important identified prey items were algae, strands of macrophytes, hydrozooids, bryzoids, pisces, crustaceans, molluscs, annelids, foraminiferans, ascidian tadpole larvae, chaetognaths, egg, arachnids and medusae. Crustaceans were the most represented preys across the predators both in terms of consumed numbers and biomass. Amphipods, especially gammarids, were the most preferred

prey by almost all (97%) of the investigated species. Four trophic guilds were identified in the TWINSPLAN based on the percent composition of the ingested biomass: omnivores, piscivores, zooplanktivores, and benthic carnivores. The omnivorous guild included, in the increasing order of omnivory: *Scarus sordidus*, *Leptoscarus vaigiensis* (Scaridae), *Siganus sutor* (Siganidae), *Pteroscirtes breviceps* (Blenniidae), *Paramonanthus barnardi* (Monacanthidae), *Canthigaster valentini*, *C. bennetti* (Tetraodontidae), *Pteroscirtes mitratus* (Blenniidae), and *Novaculichthys macrolepidodus* (Labridae). These species relied mainly on plant and other structural material, whose importance diminished with increasing omnivory. They also took other small invertebrates especially those closely associated with the algae, seagrass, bryozoa and hydrozoa (e.g., amphipods, foraminiferans, harpacticoids, isopods, medusae, molluscs, ostracods and polychaetes). This guild had generally the narrowest niche (mean $H' = 0.976 \pm 0.167$). The piscivores guild included (in decreasing importance of piscivory): *Saurida undosquamis* (Synodontidae), *Cheilinus bimaculatus* (Labridae), *Cheilodipterus quinquelineatus*, *Fowleria aurita* (Apogonidae), *Lethrinus elongatus* (Lethrinidae), *Parascorpaena mossambica* (Scorpaenidae), and *Lutjanus fulviflamma* (Lutjanidae). Their diet mainly constituted pisces and decapods with a slightly wider niche (mean $H' = 0.88 \pm 0.0220$) than the preceding guild. *Saurida undosquamis* was strictly piscivorous and had the most narrow niche of all investigated species ($H' = 0.032$). The third guild of benthic carnivores included (in decreasing order of specialisation): *Apogon lateralis* (Apogonidae), *Lethrinus harak* (Lethrinidae), *Apogon cookii* (Apogonidae), *Cheilinus oxycephalus* (Labridae), *Bothas pantherinus* (Bothidae), *Plectorhynchus gaterinus* (Haemulidae), *Syngnathoides biaculeatus* (Syngnathidae), *Cheilio inermis* (Labridae), and *Lethrinus nebulosus* (Lethrinidae). They relied on amphipods, polychaetes and tanaids as the main prey items. On average these fish took more prey items and had a more varied and broader niche (mean $H' = 1.521 \pm 0.205$). The zooplanktivorous guild had the broadest niche (mean $H' = 1.652 \pm 0.218$) and included two specialised zooplankton feeders: *Trachyrhamphus bicoarctatus* (Syngnathidae) and *Dascillus aruanus* (Pomacentridae). The remaining zooplanktivores were *Neopomacentrus fuliginosus* (Pomacentridae), *Apogon fragilis* (Apogonidae), *Pelates quadrilineatus* (Teraponidae), *Stethojulis strigiventer* (Labridae) *Apogon nigripes* (Apogonidae), and *Plotosus lineatus* (Plotosidae) (in decreasing order of niche specialisation). The principal prey item identifying this guild was calanoid copepods which constituted 40-97% of the diets among other zooplankton. Most of the species were generalist feeder, some with opportunistic tendencies, and had wide prey spectra with overlapping diets. There was also overlap in diets between younger (smaller) and older (larger) individuals of the same species.

Notes: 6303

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Thesis

Record Number: 304

Author: E. O. Wakwabi

Year: 1999

Title: The trophic organisation in the fish faunas of a tropical bay (Gazi Bay, Kenya).

City: Ghent

University: Ghent Rijksuniv., Belgium

Degree: PhD

Number of Pages: pp. 157-193.

Thesis Type: PhD Thesis.

Short Title: The trophic organisation in the fish faunas of a tropical bay (Gazi Bay, Kenya).

Keywords: Ichthyofauna, carnivores, omnivores, herbivores, spatial distribution, temporal patterns

Abstract: The trophic organisation of the ichthyofauna of Gazi Bay, Kenya is discussed. Over 330 species of fish were recorded in the bay between 1991 and 1996. The majority (>70%) of these species were marine reef associate species, about 20% were brackish water species, and 9% were euryhaline species. *Eleotris mauritanus* Bennett (Eleotridae) and *Hyppichthys heptagonus* Bleeker (Syngnathidae), which are both stenohaline brackish water species, were also recorded in the bay. A big percentage (>63%) of the recorded species were carnivorous fish, 20% were omnivorous species, and 4% were herbivorous. The diets of other 45 species were not determined. At species to species level, herbivores and higher density (over all mean catch per standard 10 minutes tow was 21.3 ± 9.51 se) than carnivores (3.9 ± 1.04 se) and omnivores (1.9 ± 0.41 se). On the spatial distribution, herbivores were more important in the Thalassodendron (mainly, Thalassodendron ciliatum monospecific) seagrass community, carnivores were important in the mangrove-seagrass associated community (outside the Thalassodendron beds), and the omnivores were important in the mangrove creek and in the bay towards the reefs. On the temporal scale, the onset of the long rainy season in May was accompanied with a drop in the total catch, in the catch rates densities, and in the number of species in the bay after a peak in April. These values remained higher during the dry season (December-April) and were relatively lower during the wet seasons (May-August). Due to the cumulative numbers over many species, carnivores may appear to be the most prevalent trophic group in the bay, but when considered at numbers of individual per species, herbivores were the dominant group in the Thalassodendron community. The higher density of carnivores and omnivores in the seagrass-mangrove associated community was probably a response to the concentration of benthic invertebrates and juvenile and small sized fish in these very shallow waters. Based on the diets taken by the fish, 32% could take pisces, 24% were zooplanktivores, and 45% were benthic feeders. 52% of the total fish species in Gazi bay could take benthic macrofauna in their diets. Few species could rely on algae. Only 61 species could take filamentous algae, 19 could take macro-algae, and only 3 species could take zooplankton in their diet.

Notes: 6304

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 305

Author: M. J. Ntiba

Year: 1998

Title: Trawl survey strategies and applications for assessing the changing state of fish communities in large marine ecosystems

Book Title: Large marine ecosystems of the Indian ocean: Assessment, sustainability, and management

Publisher: KMFRI; UoN

Pages: 23-43.

Series Editor: K. e. O. Sherman, EN (ed); Ntiba, MJ (ed)

Short Title: Trawl survey strategies and applications for assessing the changing state of fish communities in large marine ecosystems

Abbreviation: Large marine ecosystems of the Indian ocean: Assessment, sustainability, and management.

ISBN: 0632043180

Section: Kenya

Keywords: Abundance Ecosystems Fishery surveys Fishing gear Marine resources Population structure Stock assessment Trawling

Abstract: An examination is made of how trawl fishing surveys serve as an ecosystem monitoring strategy within the concept of large marine ecosystems. In particular looking at how these surveys may be used to determine the distribution, abundance, and population structure of marine resources and to monitor changes from year to year. The status of the world marine fishery landing, fishing gear and, more importantly, the various types of trawls used by the fishing industry and fishery research scientists are briefly reviewed. An example of a successful survey, the English North Sea Groundfish surveys, is presented. Some of the data from these surveys are provided to demonstrate its usefulness in ecological terms. Although these surveys are certainly desirable in East Africa coastal waters, where the ecology of the marine resources is little understood, care must be taken not to destroy valuable biotopes, such as sea grass beds and coral reef, occurring in this region.

Notes: 6305

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 306

Author: G. K. Mwatha and B. Orembo

Year: 1998

Title: The fishery in Mida creek

Series Title: Biodiversity of Mida Creek

Institution: KMFRI/KWS

Pages: 114-134

Publisher: KMFRI/KWS

Edition: Mwatha, GK (ed) Fondo, E. (ed) Uku, J. (ed) Kitheka, J.U. (ed)

Type: Final Technical Report

Short Title: The fishery in Mida creek

Abstract: Mida Creek, Kenya as part of the larger Watamu Marine National Reserve (WMNR) was studied for 20 days a month for one year to collect data in order to describe the fishery resource. These included data on catches (activity and methods of exploitation), catch effort and catch per unit effort (CPUE). The study was based on fish landing data recorded at the

creek shore. Fishing gear mostly used were recorded as traditional traps, handlines, nets and beach seines. Specific data collected were daily daytime catches, total catch per boat, fishing method, members per boat, weight and length of fish. The most common fish landed included Siganidae, Lethrinidae, Lutjanidae, Scaridae and Nemipteridae families which comprised about 80% of the total fish landed.

Notes: 6306

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 307

Author: T. R. McClanahan

Year: 1995

Title: A coral reef ecosystem-fisheries model: impacts of fishing intensity and catch selection on reef structure and processes.

Journal: Ecological Modelling

Volume: 80

Pages: 1-19

Short Title: A coral reef ecosystem-fisheries model: impacts of fishing intensity and catch selection on reef structure and processes.

Legal Note: Kenya

Keywords: Coral reef, Fishing, selection, modelling

Abstract: An aggregated energy-based coral reef simulation model was developed and used to perform fishing experiments where fishing intensity and catch selection were varied. The model is composed of two groups of primary producers (coral and algae), herbivores (herbivorous fishes and sea urchins) and carnivores (piscivores and predators of invertebrates). Gross and net primary production are calculated from coral and algal production and respiration parameters, while the calcium carbonate balance is calculated from deposition by coral and algae and erosion by sea urchins and herbivorous fish. Simulation results indicate that fishing affects the coral reef's ecology and the benefits of the fisheries yield must be weighed against impacts on reef structure and processes. The model predicts that removing all fish groups will eventually result in reef dominance by sea urchins once their predators have been removed. This results in a rapid and dramatic drop in fisheries yields and reduced algal and coral biomass and productivity. Net calcium carbonate deposition is particularly sensitive to the effect of sea urchins or fishermen on living coral. Fishing only piscivores results in low fisheries yields but high reef accretion by indirectly releasing coral from competition with algae. A management strategy of fishing only piscivores and herbivorous fishes results in the highest and most stable fisheries yields. However, under this management strategy, high levels of fishing results in increased algae that competitively exclude coral and produces a temporary reduction in calcium carbonate deposition. But, at the highest algal biomass, calcium carbonate deposition is high and solely attributable to algal deposition. Nonetheless, this form of calcium carbonate deposition may not provide the reef structure required for fish habitat and shoreline protection. It may therefore prove beneficial, over the long term, to keep fishing below this level

Notes: 6307

'File' Attachments: internal-pdf://sdarticle[6]-1162940928/sdarticle[6].pdf

Language: English

Reference Type: Journal Article

Record Number: 308

Author: E. N. Kimani, G. K. Mwatha, E. O. Wakwabi, J. M. Ntiba and B. K. Okoth

Year: 1996

Title: Fishes of a shallow tropical mangrove estuary, Gazi, Kenya.

Journal: Marine and Freshwater Research

Volume: 47

Pages: 857-868

Type of Article: Journal Article

Short Title: Fishes of a shallow tropical mangrove estuary, Gazi, Kenya.

Legal Note: Kenya

Keywords: Fish composition

abundance

mangrove

diversity

Abstract: The composition and abundance of teleosts in an estuarine mangrove bay, sampled with a beach seine-net, are described. Site 1, at the mouth of a small river, was fringed by mangroves and had a silty substratum; Site 2 was also mangrove-fringed but had a sandy substratum and seagrass patches; Site 3 had a muddy sand substratum and also supported seagrasses. In total, 128 teleost species belonging to 50 families were identified in samples collected over 12 months. Gerreidae, Atherinidae and Clupeidae accounted for 78.5% of the total number of fish. Juveniles were found for 63% of the species. Of the fish species found, 44% were species associated with coral reefs. The mean numbers of species were similar at all sites, despite the differences in substratum type. Ecological diversity indices were higher, and fish density and biomass were lower, in the mangrove-fringed silt site than in the seagrass sites. Mean number of species was highest in February and June. Most families of commercial fish sought by fishers in the area were represented in the samples.

Notes: 6308

'File' Attachments: internal-pdf://Kimani4-2839865600/Kimani4.pdf

Author Address: Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya

Language: English

Reference Type: Journal Article

Record Number: 309

Author: T. R. McClahanan and B. Kaunda-Arara

Year: 1996

Title: Fishery recovery in a coral-reef marine park and its effect on the adjacent fishery.

Journal: Conservation Biology

Volume: 10

Issue: 4

Pages: 1187-1199

Short Title: Fishery recovery in a coral-reef marine park and its effect on the adjacent fishery.

Legal Note: Kenya

Keywords: Fish, MPAs, CPUE

Abstract: Numbers of fish and their wet weights were estimated in Kenyan coral-reef lagoons on seven reefs over 6 years. Two sites were protected from fishing for over 20 years, whereas the other five sites were heavily fished in recent years. A heavily fished site was converted into a marine park (Mombasa Marine National Park, approximately 10 km super(2), no fishing allowed), and the number of fishers allowed was slowly decreased between August 1991 and August 1992. The area adjacent to the park was converted into a marine reserve (only fishing traps, lines, and gill nets allowed) that provided fishing grounds for fishers excluded from the park. Data from a fish-landing site adjacent to the newly created marine park were collected for 3 years and analyzed to determine the effect of the park's creation on fish catches. Results suggest that fishing in the reserve reduced fish wet weight by about a factor of 10 and reduced fish numbers and species richness by a factor of two. Both field studies and landing data suggest harvesting at a bionomic equilibrium. For example, approximately 65% of the landing site's fishing grounds were protected with the creation of the park, and 65% of the fishers quit the studied landing, leaving nearly the same density of fishers in the remaining area (similar to 12 fishers/km super(2)). Further, fishers using pull seines were excluded from the reserve, and their numbers were replaced by fishers using other gear (mostly basket traps). Although the overall catch per unit effort increased by about 110% after the park's creation, the total fish landed decreased by 35% and the catch per unit effort decreased toward the end of the study period despite increasing fish abundance in the park. Although establishment of small parks elsewhere have increased the total catch, the large park we studied did not; one reason may have been the lower ratio of edge to park area of the large park. Alternatively, the park's edge may have provided a good fishing area, so fishing effort may have been highest along the park's edge. Consequently, a barrier may have been created that restricted fish dispersal to most of the reserve. Therefore, the area that had an increased catch was small (<1 to 2 km from the edge) and could not compensate for the lost fishing area. Most fish species within the park showed recovery after fisher exclusion. Total fish wet weights 3 years after the fishers' exclusion were 25% below the older marine parks. Poor recovery of the herbivorous parrot and surgeonfish can account for much of this shortfall. Competition for resources with sea urchins appear to be slowing recovery of these two groups. A study site 2.5 km from the park's southern boundary, in the reserve section of the protected area, showed no changes in fish abundance over the study period, despite changing gear regulations.

Notes: 6309

'File' Attachments: <internal-pdf://McClanahan et al-3490930688/McClanahan et al.pdf>

Language: English

Reference Type: Journal Article

Record Number: 310

Author: R. M. Nzioka

Year: 1995

Title: Aspects of the biology of the reef fish *Scolopsis bimaculatus* (Ruppel 1828) in Kenya: age

and growth studies.

Journal: Kenya Journal of Science & Technology (B).

Volume: 11

Issue: 1-2

Pages: 8-14.

Short Title: Aspects of the biology of the reef fish *Scolopsis bimaculatus* (Ruppel 1828) in Kenya: age and growth studies.

Legal Note: Kenya

Keywords: *Scolopsis bimaculatus*, growth, age

Abstract: Age, growth and mortality rates of the moncle bream, *Scolopsis bimaculatus* are described. It is a fish associated with coral reef in Vanga and Shimoni area near Mpunguti, especially within the Kisite Marine National Park in Kenya. The Petersen method was used to obtain age-at-length data from length frequency data of *S. bimaculatus* captured by traps. Growth was described by a von Bertalanffy growth curve with parameters $K=0.34$ and $L_{\infty}=30.4\text{cm TL}$. The total mortality rate (Z) was estimated from length converted catch curve and was found to be 1.97, while an empirical method of calculating natural mortality M gave estimate of 0.86.

Notes: 6310

'File' Attachments: <internal-pdf://nzioka2-3495977473/nzioka2.pdf>

Language: English

Reference Type: Journal Article

Record Number: 311

Author: T. F. De Souza

Year: 1988

Title: Reproduction, length-weight relationship and condition factor in *Siganus sutor* (Valenciennes, 1835) (Pisces: Siganidae) from the Kenyan waters of the western Indian Ocean.

Journal: Kenya Journal of Sciences Series (B)

Volume: Vol. 9

Issue: no.1-2

Pages: pp 89-101

Short Title: Reproduction, length-weight relationship and condition factor in *Siganus sutor* (Valenciennes, 1835) (Pisces: Siganidae) from the Kenyan waters of the western Indian Ocean.

Legal Note: Kenya

Keywords: *Siganus sutor*, fecundity, condition factor, sex ratio, length-weight relationship

Abstract: A study of condition factor and some aspects of reproduction in *Siganus sutor* was carried out between May 1979 and April 1982 in Kenya. Egg counts from 31 ripe females ranged from 126,000 to 1,950,000 with a mean of 700,000. Fecundity was correlated with length, body weight and gonad weight. The minimum size at maturity was about 24 cm TL for both males and females. No definite breeding season was observed, occasional spawners being found throughout the year. But two breeding peaks were apparent, a major one from October to January, and a subsidiary peak during April/May. The overall sex ratio differed significantly from 1:1. The length-weight relationship was $\text{Log sub}(10)L$. In general the condition factor for females was higher than that for males.

Notes: 6311

'File' Attachments: internal-pdf://de Sousa_89-102-2400005120/de Sousa_89-102.pdf

Language: English

Reference Type: Journal Article

Record Number: 312

Author: M. C. Little, P. J. Reay and S. J. Grove

Year: 1988

Title: The fish community of an East African mangrove creek.

Journal: Journal of Fish Biology

Volume: 32

Pages: 729-747

Start Page: J. Fish Biol.

Date: 1988

Type of Article: Journal Article

Short Title: The fish community of an East African mangrove creek.

Legal Note: Kenya

Keywords: Fish community, mangrove, catches

Abstract: The results of a beach seine survey of an East African mangrove creek are presented. The fish community of the creek is described and is compared with that of a nearby lagoonal site and with those described for other mangrove and estuarine systems. The species composition was found to differ substantially between the creek and the lagoon site, though diversity indices for the two areas were similar. Eighty-three species of teleost fish were collected from the mangrove area of the creek, Approximately 90% of the fish caught were juveniles. Plankton sampling was also carried out and representatives of 21 fish families were collected as larvae within the creek. Catches from both beach seining and plankton sampling in the mangrove areas were dominated numerically by resident clupeid and gobiid species. No systematic spatial or temporal variation in the community structure was identified over the study period.

Notes: 6312

'File' Attachments: internal-pdf://Little et al-0302920448/Little et al.pdf

Language: English

Reference Type: Conference Paper

Record Number: 313

Author: M. A. Samoilys

Year: 1988

Title: Abundance and species richness of coral reef fish on the Kenyan Coast: the effects of protective management and fishing.

Conference Name: Proceedings of the 6th international coral reef symposium

Volume: 2

Pages: 261-266.

Type: Proceedings

Pub Place: Kenya

Keywords: Coral reef fish, Species richness, abundance

Abstract: Underwater censuses were used to measure species richness and abundance of coral reef fish at 19 study sites on the Kenyan coast. While species richness was highest in marine parks where no fishing or collecting is allowed, the same was not true for fish abundance, or for biomass of commercially important fish. Some of the highest densities and weights of fish were recorded from the marine reserves where traditional fishing methods are allowed. Areas with higher fishing intensity has smaller standing crops of fish, but not comparably smaller abundances. This suggests that average fish size is lowered by more intense fishing. Two factors, siltation from rivers and dynamite "fishing", have a major impact on the fish communities. Reefs badly damaged from dynamiting, including Mako Kokwe in Kisite marine park, are characterised by low species richness and a low biomass of commercially important species.

Notes: 6313

'File' Attachments: internal-pdf://SAMOILYS[1]-1766045953/SAMOILYS[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 314

Author: T. R. McClanahan

Year: 1987

Title: Overfishing and Coral Reef Degradation: A Preliminary Report from East Africa.

Journal: Conservation Biology

Volume: 1

Issue: 2

Pages: 97–102

Short Title: Overfishing and Coral Reef Degradation: A Preliminary Report from East Africa.

Legal Note: Kenya

Keywords: Coral reef

Abstract: During the course of a survey of Kenya's coral reefs, which included preliminary studies of intact and degraded reefs, the authors developed a working hypothesis of coral reef degradation. If valid, the hypothesis could play a crucial role in the management and conservation of coral reefs in East Africa as well as in the Indo-Pacific as a whole.

Notes: 6314

Language: English

Reference Type: Journal Article

Record Number: 315

Author: M. De Troch, J. Mees, I. Papadopoulos and E. O. Wakwabi

Year: 1999

Title: Fish communities in a tropical bay (Gazi Bay, Kenya): Seagrass beds vs. unvegetated areas;

Journal: Netherlands Journal of Zoology

Volume: 46

Issue: 3-4

Pages: 236-252

Date: 1999

Type of Article: Journal Article

Short Title: Fish communities in a tropical bay (Gazi Bay, Kenya): Seagrass beds vs. unvegetated areas;

Legal Note: Kenya

Keywords: Fish communities, Gazi Bay, seagrass

Abstract: The fish fauna of seagrass beds and unvegetated areas in Gazi Bay (Kenya) was sampled in 9 stations with a beach seine. A total of 3601 fishes (>95% juveniles) was caught, comprising 75 species (40 families). The spatial patterns in the fish communities were investigated with multivariate statistical techniques. A first community occurred in the downstream part of a major river-fed creek and was characterised by a low density and diversity. These were sandy bottom stations with sparse seagrass vegetation. The dominant species of this community were *Leiognathus elongatus* and *Bothus myriaster*. A second community occurred in the upstream part of the same creek, and was characterised by a high density and diversity. *Gerres acinaces* and *Atherinomorus duodecimalis* were the dominant species. A third community occurred in the stations of the shallow part of the bay and was characterised by a high diversity but a lower density. The dominant species were *Apogon thermalis* and *G. acinaces*. Both latter communities occurred in stations with dense seagrass beds.

Notes: 6315

'File' Attachments: internal-pdf://De Troch2-2618365696/De Troch2.pdf

Language: English

Reference Type: Report

Record Number: 317

Author: E. O. Omondi

Year: 1995

Title: Cetaceans and fisheries in Kenya coastal waters: a preliminary study

Institution: UNESCO

Volume: 66

Pages: 124-147

Publisher: UNESCO

Type: UNESCO reports in marine science

Department/Division: m. science

Short Title: Coastal systems and sustainable development in Africa.

Abstract: Of all marine resources characteristic of the Kenyan coast, marine mammals are least studied singly or in association with other resources. In the paper, available records on cetacean catches by districts between 1978-1991 inclusive were used to assess the status and trend of their fishery, distribution, and interactions with sharks, clupeids and tuna landings. Spatial and temporal variations in takes were evident. The Mombasa district led in total catch (62.2 tons) while the Tana River district ranked last (0 tons). Fluctuations in catch were highest in Mombasa (sd=3.8) and lowest in Lamu (sd=0.7). The mean annual landings at $p < 0.05$ corresponded well with the totals for the districts. The sharks, clupeids and tuna were landed

by a range of fishing gears that changed with time. Total fish catch by species fluctuated considerably. Although the lines of 'best fit' showed some relationship between the landings of sharks, clupeids and tuna on one hand and cetaceans on the other, the linear component on the relationships were not highly significant at $p < 0.05$ (4.84). The possible impacts of other human activities on the cetacean populations are discussed. Priority areas in marine mammal studies and management strategies vital in ensuring a balanced co-existence of the coastal populations and ecosystem are also discussed.

Notes: 6317

'File' Attachments: internal-pdf://112200mo[1]-2215630848/112200mo[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 318

Author: S. A. Iversen

Year: 1984

Title: KENYAN MARINE FISH RESOURCES IN WATERS DEEPER THAN 10 M INVESTIGATED BY R/V "DR. FRIDTJOF NANSEN"

Institution: FAO

Publisher: NORAD

Edition: Edited by S. A. Iversen and S. Myklevoll

Date: 13–15 March 1984.

Type: Report

Short Title: KENYAN MARINE FISH RESOURCES IN WATERS DEEPER THAN 10 M INVESTIGATED BY R/V "DR. FRIDTJOF NANSEN"

Keywords: Fish abundance, distribution, biomass, yield

Abstract: The Kenyan waters in the depth region 10–700 m have been surveyed four times by the R/V "Dr. Fridtjof Nansen" during the period 1980–1983. The abundance and distribution of fish was investigated acoustically and by trawling. The estimated fish abundance in the investigated area was rather low. This mainly because the shelf and thereby the productive area is small. The estimated fish biomass was in the range 18000–32000 tonnes. This is an underestimate of the total biomass because waters shallower than 10 m is not covered by the vessel. This is a rather productive and important area where the fishery takes place to day. The main part of the observed biomass was in waters shallower than 200 m. The highest abundance was observed in the depth 10–50 m. In these depths about 50% of the trawl catches were silverbellies.

These investigations demonstrate that the total catch of marine fish might be increased by extending the fishery beyond the reef. The potential yield of the area beyond the reef was estimated at about 5000–8000 tonnes. However, a rather large proportion of the potential yield is silverbellies which is of limited importance for the market to day. The fish density is generally too low to support trawl and purse seine fishery. Therefore the traditional artisanal fishery should be encouraged to extend into the area beyond the reef.

Notes: 6318

'File' Attachments: internal-pdf://THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO

REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA-1673676800/THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA.mht

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 319

Author: S. C. Venema

Year: 1984

Title: Review of marine resource surveys in Kenyan waters

City: Mombasa

Institution: FAO

Publisher: FAO

Edition: Edited by S. A. Iversen and S. Myklevoll

Date: 13–15 March 1984

Type: Report

Short Title: Review of marine resource surveys in Kenyan waters

Alternate Title: THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA

Keywords: Surveys, trawling, biotopes, pelagic, demersal

Abstract: A number of resource surveys have been executed in Kenyan waters mainly through FAO projects. Bottom trawl surveys in inshore waters were executed in the sixties with the Kenyan research vessel SHAKWE and with commercial trawlers, while an extensive bottom trawl survey of deeper waters was executed with FAO's vessel UJUZI in 1979-81, assisted for the deeper areas by the DR. FRIDTJOF NANSEN in December 1980. Acoustic and trawl surveys were made in the period 1975-76 by the R/V DR. FRIDTJOF NANSEN and in 1976-77 by the R/V PROF. MESYATSEV. The North Kenya Bank was visited with hook and line gear by the R/V MANIHINE and also by the UJUZI. Huge beam trawls were introduced by the commercial trawler KUSI assisted by a Dutch project. The creeks and inlets were submitted to a detailed inspection by the SHAKWE assisted by an Icelandic bilateral project around 1980.

Notes: 6319

'File' Attachments: internal-pdf://Venema-1390618880/Venema.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 320

Author: B. W. Oduor

Year: 1984

Title: STATUS OF FISH CATCHES AND LANDINGS IN KENYA

City: Mombasa

Institution: FAO

Publisher: FAO

Edition: Edited by S. A. Iversen and S. Myklevoll

Date: 13–15 March 1984

Type: Report

Short Title: STATUS OF FISH CATCHES AND LANDINGS IN KENYA

Keywords: Fishery, gears, vessels, statistics, catches

Abstract: Kenya's marine fish landings are almost all from the 12,000 artisanal fishermen operating 4,000 small boats with gillnets, hooks and lines, shark nets, beach seines and traps within the inshore areas. Factors of marketing (inavailability of dealers), communication (roads) and administration have influenced siting of landing beaches most of which have been provided with handling facilities by the Fisheries Department. These are the points for collecting fish landing data. The major fishing areas are the Kiunga coastline and Lamu islands in the north; Tana River mouth, Ngwana Bay and Malindi area including the offshore North Kenya Bank and Shimoni, Vanga, Funzi Island and coral reef areas in the southern border.

Notes: 6320

'File' Attachments: internal-pdf://THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA-0168582400/THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA.mht

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 321

Author: J. S. Mbuga

Year: 1984

Title: Fishing gears of the Kenya marine waters

Series Editor: E. b. S. A. I. a. S. Myklevoll

Series Title: The proceedings of the NORAD-KENYA seminar to review the marine fish stocks and fisheries in Kenya

City: Mombasa

Institution: FAO

Publisher: FAO

Edition: Edited by S. A. Iversen and S. Myklevoll

Type: Report

Short Title: Fishing gears of the Kenya marine waters

Keywords: Fishing, gears, seasons

Abstract: Fishing gears and methods play a major role in the development of our fisheries resources. The type of equipment used in harvesting our fishery resources go a long way in determining whether we engage in subsistence or commercial fishing operations. Ungwana Bay which has been a fertile fishing ground has virtually been depleted of prawn stocks. The Kenya marine weather regime can be divided into four distinct annual seasons which form the fishing calendar in the year. Each of the four seasons has got a distinct effect on our fishing pattern.

Notes: 6321

'File' Attachments: internal-pdf://THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO

REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA-3605945088/THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA.mht

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 322

Author: E. N. Fondo

Year: 2005

Title: Assessment of the Kenyan marine fisheries from selected fishing areas

Institution: UNU-FTP

Publisher: UNU-FTP

Short Title: Assessment of the Kenyan marine fisheries from selected fishing areas

Keywords: Fisheries, Lamu, Vanga, fish species

Abstract: Lack of information on fish stocks, in addition to inadequate and unreliable data, have been a major concern in the management of marine resources in Kenya. A need to improve methodology in data collection and stock assessment has been recognized. Data collected by the Fisheries Program of the Kenya Marine and Fisheries Research Institute, from Lamu (north coast of Kenya) and Vanga (south coast of Kenya) in 2002 and 2003, was used to demonstrate various analyses. Mapping of catch distributions in the two areas, CPUE calculation, species composition, length distributions and length weight relationships for selected species were performed. Results show that three species: *Lethrinus*, *Lutjanus* and *Siganus* are targeted in Lamu and Vanga. In Vanga, smaller fish (juveniles) are caught compared to Lamu. No conclusions could be made due to the limited data available. However, recommendations are made on improvement of the data to be collected and the type of analyses to be performed in the future when adequate data is available.

Notes: 6322

'File' Attachments: <internal-pdf://EstherPRF04-1385490176/EstherPRF04.pdf>

Author Address: Kenya Marine and Fisheries Research Institute

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article

Record Number: 323

Author: F. Department

Year: 2004

Title: Fisheries Annual Statistical Bulletin

Magazine: Fisheries Bulletin

Place Published: Fisheries Department

Publisher: Fisheries Department, GoK

Short Title: Fisheries Annual Statistical Bulletin

Keywords: Fisheries, landings

Abstract: The fisheries sector plays a significant role in employment and income generation.

During the year 2004, the sector supported a total of 54,149 people directly. Kenya's fisheries are mainly composed of freshwater (lakes, rivers and dams) and marine (Indian Ocean), with aquaculture still at infancy. Fish production in 2004 was 135,578 metric tonnes valued at Ksh.7,760,806,000. The freshwater fishery accounted for about 94% of Kenya's total fish production. The marine fish production potential is estimated at 150,000 MT per year. The fish production in the year 2004 was 7,805 MT or approximately 6% of the country's total annual landings.

Notes: 6323

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 324

Author: Anon

Title: Work-report no. 6. Line fishing during the survey period 1979–1981.

City: Mombasa

Publisher: KMFRI

Type: ReportKMFRI

Short Title: Work-report no. 6. Line fishing during the survey period 1979–1981.

Abstract: With four hand operated snapper reels have been fished on, for R/V UJUZI, non trawlable grounds mainly on the North Kenya Bank. The catches have been analysed by region, season and depth and compared with handline catches. Average catch rates on the North Kenya Bank ranged from 2-3-6.4 kgs/reel-hour, highest in the depth range 16-75 meters during the south-east monsoon period. In other areas the average catch rates were below 1 kg/reel-hour. In the north-east monsoon period the family Lutjanidae formed the bulk of the catches, with two species *Lutjanus sanguineus* and *Pristipomoides* (~ clearly depth restricted. In the south-east monsoon period the family Serranidae dominated with its species *EPinephlus tauvina* especially in the shallower waters.

Notes: 6324

'File' Attachments: internal-pdf://Work_Report_6-1870106880/Work_Report_6.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 325

Author: M. Watson and R. F. G. Ormond

Year: 1994

Title: Effects of an artisanal fishery on the fish and urchin populations of a Kenyan coral reef.

Journal: Marine Ecology Progress Series

Volume: 109

Issue: 2-3

Pages: 115-129

Type of Article: Journal Article

Short Title: Effects of an artisanal fishery on the fish and urchin populations of a Kenyan coral reef.

Legal Note: Kenya

Abstract: An investigation of the effects of artisanal fishing on coral reef fish assemblage structure was undertaken through a comparison of fish stocks on 2 apparently identical sets of reefs, one (within the Kisite Marine National Park) on which all fishing is prohibited, and one (within the Mpunguti Marine National Reserve) on which artisanal fishing only is allowed. Replicate visual censuses of fish along 250 X 10 m band transects at 6 intensive study sites demonstrated that there were large differences in population density and biomass of the principal families of commercial reef fish (Lethrinidae, Lutjanidae and Serranidae) between the unfished marine park area and the adjacent intensively fished marine reserve area, with abundances of commercial species within the park (unfished) being up to 10 or more times those in the reserve (fished). In addition, 6 species of butterflyfish (Chaetodontidae) and 2 species of triggerfish (Balistidae) were significantly more abundant on shallow and/or deep transects within the park. For most species of commercial fish, larger individuals were observed in the park than in the reserve, an effect expected from greater fishing pressure within the reserve. In contrast, smaller *Cephalopholis* spp. (Serranidae), 1 species of butterflyfish, and sea urchins (mostly *Echinornetra mathaei*) were significantly more abundant on transects in the reserve. It is suggested that these increased abundances may be second order effects (mediated by reduced competition or predation) of increased fishing pressure. In particular, opposing differences in abundance of predatory triggerfishes (Balistidae) and emperors (Lethrinidae) and of sea urchins are compatible with the view that higher populations of sea urchins may sometimes occur where the densities of their predators are reduced. Overall results allow an assessment of the effect of the artisanal fishery on the fish stocks, and provide a measure of the effectiveness of protection afforded by the marine park.

Notes: 6325

'File' Attachments: internal-pdf://Watson-3672709120/Watson.pdf

Language: English

Reference Type: Conference Paper

Record Number: 326

Author: T. R. McClanahan

Year: 1997

Title: Effects of fishing on East African coral reefs.

Conference Name: 8th International Coral Reef Symposium

Publisher: KMFRI

Volume: 2

Pages: 1533-1538.

Type: Proceedings Article

Pub Place: Kenya

Abstract: This study compares shallow leeward coral reef sites in East Africa. I compared protected and unprotected and fringing and patch reefs of southern Kenya and northern Tanzania to determine the effect of reef structure and fishing on the abundance and species richness of fish. Studies of the benthic community including coral, algae and sea urchins were

also completed. Fishing is the strongest of the two factors. Fishing had its largest effect in Kenya's fringing reef lagoon where fish wet weights were reduced from 1100 to 75 kg/ha and the number of species was reduced by 50%. The studied patch reefs showed less effect from fishing with fished reefs generally maintaining a total fish wet weight of around 200 kg/ha and only small reductions in species richness at the scale of 1.0 ha. Sea urchins were much more abundant in fished reefs regardless of the reef type and was attributable to lower predation and triggerfish abundance in fished reefs. Patch reefs had lower abundance of the rock-boring sea urchin (*Echinometra mathaei*) than fringing reef sites. This may, in part, explain the lesser indirect effects of fishing in patch compared to fringing reefs. The pristine patch reef had a lower abundance of coral and fish, especially triggerfish and goatfish, but more scavengers than the studied fringing reefs. Reef structure can modify the effects of fishing because the abundance and distribution of important species (seagrasses, the rock-boring sea urchin, and triggerfish in this study) are influenced by habitat.

Notes: 6326

'File' Attachments: internal-pdf://mcclanahan_africa-2298064896/mcclanahan_africa.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 327

Author: T. R. McClanahan

Year: 1997

Title: Recovery of fish populations from heavy fishing: does time heal all?

Conference Name: 8th International Coral Reef Symposium. :

Publisher: KMFRI

Volume: 2

Pages: 2033-2038.

Pub Place: Kenya

Abstract: Studies in a recently created marine park indicate that recovery of fish population can be variable once fishing is reduced and appeared to depend on the abundance and species composition of sea urchins in the studied areas. The most intensely studied sites experienced about a 5fold increase in total fish wet weight over the four year study period. Sea urchin populations were reduced by 60% through predation by the terminal-male wrasse (*Cheilinus trilobatus*) and the red-lined triggerfish (*Balistapus undulatus*). Coral cover also increased dramatically from 8% to 45% in this area over the 7 years of study. Some areas, with a high abundance of the largest-bodied sea urchin *Echinothrix diadema* or the more cryptic *Diadema savignyi*, showed poor recovery in fish populations even after 4 years of protection. Sea urchin reduction experiments were undertaken at the scale of 10,000 m². Reduction studies produced increases in many fish populations which suggests that some species of sea urchin may suppress the recovery of fishes. suppression of fish populations by sea urchins was most evident for herbivorous parrotfish but some other trophic groups such as wrasses, scavengers, and butterflyfishes also increased. consequently, in some cases, restoration programs such as sea urchin reduction may be necessary to assist the recovery of reef fish populations once protection from fishing is initiated to gain the benefits of marine reserves.

Notes: 6327

'File' Attachments:

internal-pdf://mcclanahan_population-4278159360/mcclanahan_population.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 328

Author: M. Watson, R. F. G. Ormond and L. Holliday

Year: 1997

Title: The role of Kenya's marine protected areas in artisanal fisheries management.

Conference Name: Proc. 8th Int Coral Reef Symp. Panama

Volume: 2

Pages: 1955-1960

Type: Proceedings Article

Pub Place: Kenya

Abstract: We conducted underwater visual censuses of commercially important Lethrinidae, Lutjanidae and Serranidae between 1992 and 1995 within areas protected and not protected from fishing on the Kenyan coast, and compared results with previously published data. Commercial piscivorous species have declined on fished reefs at Diani and in Malindi Marine National Reserve. Within the unfished Malindi and Watamu Marine National Parks abundances of commercially important species have also fallen since 1988 and are not significantly different from adjacent fished reefs. This is in contrast with data from the Kisite Marine National Park and the adjacent Mpunguti Marine National Reserve where not only are populations of commercial families higher in the unfished park than the fished reserve, but abundances were higher in 1992 than in 1988; they increased further between 1992 and 1994 on fished as well as unfished reefs. The artisanal fish catch associated with Mpunguti Marine National Reserve which had declined during the 1980s has showed a marked recovery since 1989, the year in which enforcement of the fishing ban was improved. The changing proportions of piscivorous and herbivorous fish in the catch support the interpretation that the park acts as a harvest refuge for top predators, replenishing the neighbouring fishery. In contrast herbivores dominate the catches from the Malindi Marine National Reserve suggesting the fishery there does not benefit from its position between two protected areas. Illegal fishing may be limiting catches at Malindi. Effective enforcement of fishing bans is critical if the potential benefits of harvest refugia to reef fisheries are to be realised. With this proviso, protected areas such as the planned reserve at Diani can benefit fisheries interests as well as tourism and conservation. pelagic stage in the reef fish life-cycle. Thus protected areas may buffer fisheries against over exploitation. Additionally, populations of fish in harvest refugia may increase to the extent that adults or juveniles 'spillover' into adjacent fished areas. Spillover will be influenced by several factors including habitats adjacent to the refuge, i.e. 'edge permeability' (Sale et al 1984, Stamps et al 1987) and the perimeter to area ratio (Buechner 1987). Trends in fisheries landings and observed fish populations in fishing grounds adjacent to protected areas may indicate the value of protection for fisheries management. This paper presents evidence that the fishery within Mpunguti MNR is benefiting from the adjacent Kisite MNP. However, commercial

catches adjacent to other protected areas at Malindi and Watamu show no such benefit and species abundances in protected areas there compare more closely with those in the fished reserves and in unprotected areas such as Diani and Kilifi.

Notes: 6328

'File' Attachments:

internal-pdf://watson_ormond_holliday[1]-0666125056/watson_ormond_holliday[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 329

Author: J. Mees, G. U. Mwamsojo and E. O. Wakwabi

Year: 1998

Title: Aspects of biology and feeding ecology of the orbiculate cardinal fish *sphaeramia orbicularis* (Cuvier, 1828) (Teleostei: Apogonidae) in a Kenyan mangroves forest.

Journal: Biology Jaarb Dodonaea

Volume: 66

Pages: 134-145

Date: 2000

Type of Article: Journal Article

Short Title: Aspects of biology and feeding ecology of the orbiculate cardinal fish *sphaeramia orbicularis* (Cuvier, 1828) (Teleostei: Apogonidae) in a Kenyan mangroves forest.

Legal Note: Kenya

Abstract: The orbiculate cardinal fish *Sphaeramia orbicularis* is the most abundant teleost among the root system of the extensive mangrove forests bordering Gazi Bay, Kenya. The species was never recorded from the bay proper and it can thus be considered to be a true mangrove resident. The sampled population clearly consisted of two cohorts: the modes were approximately 65mm and 80 mm. Most individuals with standard lengths >40mm had mature gonads ; the number of eggs ranged from 4,700 to 10,000. *S. orbicularis* are carnivores, mainly feeding on small epi- and hyperbenthic crustaceans. Numerically, gammaridean amphipods and tanaids were the dominant prey categories in the stomachs of both size classes. Individuals belonging to the smaller cohort mainly supplemented their diet with harpacticoid copepods, while larger fishes also fed on postlarval brachyuran crabs and caridean shrimp. The latter two taxa were important prey items in gravimetical terms. A preliminary analysis of the otoliths revealed 21 stress marks and 20 striations. An attempt to validate these growth rings indicated that the average age of fishes in the samples ranged from 11 (smaller cohort) to 15 (larger cohort) months.

Notes: 6329

'File' Attachments: internal-pdf://157659-2651026688/157659.pdf

Language: English

Reference Type: Journal Article

Record Number: 330

Author: T. R. McClanahan, N. A. Muthiga, A. T. Kamukuru, H. Machano and R. Kiambo

Year: 1999

Title: The effect of fishing and marine protected areas on the coral reefs of northern Tanzania.

Journal: Biological Conservation

Volume: 89

Pages: 161-182

Short Title: The effect of fishing and marine protected areas on the coral reefs of northern Tanzania.

Legal Note: Kenya

Abstract: The macrobenthic (coral, algae, and sea urchins) and fish communities in 15 back-reef sites on the patch and rock-island reefs of southern Kenya and northern Tanzania (~ 250 km of coastline) were studied in order to (1) test an overfishing model developed in Kenya's fringing reef (McClanahan, 1995a, A coral reef ecosystem-fisheries model: impacts of fishing intensity and catch selection on reef structure and processes. *Ecol. Model.* 80, 1-19.), (2) develop a baseline of information on Tanzanian coral reef ecosystems, and (3) determine if some of the government gazetted but unprotected marine reserves were still deserving of protective management. The overfishing model was tested by comparing five sites in two fully protected reefs one in southern Kenya (Kisite Marine National Park) and the other in Zanzibar (Chumbe Island Coral Park)-with 10 sites in eight fished reefs, and by comparing coral surveys conducted in reefs off of Dar es Salaam in 1974 with present-day studies. These comparisons suggest that fishing is primarily reducing the abundance of angelfish, butterflyfish, parrotfish, scavengers, surgeonfish, and triggerfish groups while some species of small-bodied damselfish and wrasse appear to have benefited. The total fish wet weight estimate was 3.5 times higher in protected than unprotected sites. Sea urchin abundance was six times higher, and predation rates on tethered sea urchin *Echinometra mathaei* were two times lower, in unprotected compared to protected sites. This is largely attributable to the reduction of the red-lined triggerfish *Balistapus undulatus* and other sea urchin predators by fishing. Loss of coral cover and changes in coral generic composition had occurred in four of the five sites visited in the Dares Salaam area after the 22-year period. There was no evidence for species losses. One site appeared to be severely damaged over this time. Some reefs were dominated by fleshy brown algae, such as *Sargassum* and *Dictyota*, which may result from a loss of grazers and coral cover. Reduced fishing effort, elimination of destructive gear (dynamite and beach seines), protection of vulnerable species and, in some cases, sea urchin reductions could rectify the problems of overfishing. Despite the damage, the gazetted but unprotected reefs of Mbudya and Bongoyo still have high potential as marine protected areas due to the persistence of species and reef structure.

Notes: 6330

'File' Attachments: <internal-pdf://McClanahan99-1108494080/McClanahan99.pdf>

Language: English

Reference Type: Journal Article

Record Number: 331

Author: M. De Troch, J. Mees and E. O. Wakwabi

Year: 1998

Title: Diets of abundant fishes from beach seine catches in seagrass beds of a tropical Bay (Gazi

Bay, Kenya).

Journal: Belgium Journal of Zoology

Volume: 128

Issue: 2

Pages: 35-154.

Date: 1998

Type of Article: Journal Article

Short Title: Belg. J. Zool.

Legal Note: Kenya

Keywords: fish species

Abstract: The composition of the diet of 14 fish species that were common in beach seine catches over the seagrass beds of Gazi Bay (Kenya) was investigated. Three trophic guilds could be distinguished based on dietary diversity and on the numerical and gravimetric composition of the diet. *Herklotsichthys quadrimaculatus*, *Stolephorus indicus* and *Atherinomorus duodecimalis* were planktivores. Their stomach fullness index was low and the diet was not diverse. The main food items were harpacticoid and calanoid copepods and brachyuran zoea and megalopae. *Apogon thermalis*, *Fowleria aurita*, *Paramonacanthus barnardi*, *Mulloidides flavolineatus*, *Lutjanus fulviflamma*, *L. argentimaculatus* and *Gerres acinaces* were benthivores, mainly feeding on small epi- and hyperbenthic prey. Their diet was very diverse and it was dominated by Amphipoda (Gammaridea), Tanaidacea and Mysidacea. Their fullness indices were low, but a little bit higher than those observed for the planktivores. A third group were the 'piscivores': *Bothus myriaster*, *Fistularia commersonii*, *Sphyraena barracuda* and *Plotosus lineatus*. The dominant items in the food spectrum of these species were postlarval fishes and large nektonic invertebrates (gammaridean amphipods, mysids, shrimp and crabs). Their diet was not diverse and the fullness index was much higher than that of the other species examined. All other species caught were further classified according to the following feeding guilds: herbivores, planktivores, benthivores (epi- and hyperbenthivores) and piscivores. The ichthyofauna of Gazi Bay was clearly dominated by benthivores.

Notes: 6331

URL: www.vliz.be/imisdocs/publications/58187.pdf

'File' Attachments: [internal-pdf://58187\[1\]-3533872384/58187\[1\].pdf](#)

Language: English

Reference Type: Journal Article

Record Number: 332

Author: T. R. McClanahan, M. Nugues and S. Mwachireya

Year: 1994

Title: Fish and sea urchin herbivory and competition in Kenyan coral reef lagoons: the role of reef management.

Journal: Journal of experimental marine biology and ecology

Volume: 184

Issue: 2

Pages: 237-254

Type of Article: Journal Article

Short Title: Fish and sea urchin herbivory and competition in Kenyan coral reef lagoons: the role of reef management.

Legal Note: Kenya

Abstract: The impact of «overfishing» on coral-reef herbivores was studied using *Thalassia* and *Sargassum* bioassays at two reefs protected from fishing for over 15 yr, one «transition reef» protected for ~ 2 yr, and three unprotected reefs. The primary goals of this research were to (1) assess the ability of an herbivory assay to distinguish between (a) herbivore types such as sea urchins and herbivorous fishes (i.e. parrotfish and surgeonfish), (b) rates of herbivory by sea urchins and herbivorous fishes, (2) potential impacts of coral-reef herbivores on seagrass species composition and abundance, and (3) the role that fishing plays in mediating competitive interactions between sea urchins and herbivorous fishes. Studied reefs differed in their management regulations and enforcement such that impacts of fishing regulations could be partly distinguished from species interactions. Parrotfishes appear to be the dominant fishes feeding on the assay. The sea urchin *Echinothrix diadema* (Linnaeus) exhibited a much higher preference for the assay than other sea urchin species. Consequently, the variable species composition of herbivorous fishes and sea urchins and their feeding preferences make between-site comparisons of herbivory problematic. However, if sites with high numbers of *Echinothrix* are excluded and the majority of fish bites on the *Thalassia* assay are attributed to a few species of parrotfish, then between-site and between-treatment comparisons of relative herbivory can be made. Experimental reduction of sea urchin abundance led to increased bite rates on herbivory assays by parrotfishes at protected site but not the unprotected sites. These results imply that sea urchins can reduce grazing rates of some species of parrotfishes. The species composition of seagrass communities in protected and unprotected reefs appears to be partially affected by prey choices of the dominant grazers such that parrotfish and *Echinothrix* sea urchins favor *Thalassia* dominance while other species of sea urchin such as *Diadema setosum*, *D. savignyi* (Audouin) and *Echinometra mathaei* de Blainville favor *Thalassia* dominance.

Notes: 6332

'File' Attachments: [internal-pdf://Nugues et al-3781796097/Nugues et al.pdf](internal-pdf://Nugues%20et%20al-3781796097/Nugues%20et%20al.pdf)

Language: English

Reference Type: Journal Article

Record Number: 333

Author: M. J. Ntiba and V. Jaccarini

Year: 1992

Title: The effect of oocytic atresia on fecundity estimates of the rabbit fish *Siganus sutor* (Pisces: Siganidae) of Kenyan marine inshore waters.

Journal: *Hydrobiologia*

Volume: 247

Issue: 1-3

Pages: 215-222

Type of Article: Journal Article

Short Title: The effect of oocytic atresia on fecundity estimates of the rabbit fish *Siganus sutor* (Pisces: Siganidae) of Kenyan marine inshore waters.

ISSN: 0018-8158.

Legal Note: Kenya

Abstract: In the strongly group-synchronized oocyte development of *Siganus sutor* (Valenciennes, 1835) the group of oocytes to be released in the following spawning, is identified. The smallest size of oocyte belonging to this group was identified by the presence of cytoplasmic vacuoles in oocytes in histological sections. These vacuolated oocytes corresponded to oocytes of 150 μm diameter obtained by treatment with Gilson's fixative. The mean number of such oocytes in stage 4 (late developing) ovaries was found to be 638 000.

Notes: 6333

'File' Attachments:

internal-pdf://Hydrobiologia_215-222-1494150400/Hydrobiologia_215-222.pdf

Language: English

Reference Type: Journal Article

Record Number: 334

Author: M. J. Ntiba and V. Jaccarini

Year: 1990

Title: Gonad maturation and spawning times of *Siganus sutor* off the Kenya coast: evidence for definite spawning seasons in a tropical fish.

Journal: Journal of Fish Biology

Volume: Vol. 37

Pages: pp. 315-325

Short Title: Gonad maturation and spawning times of *Siganus sutor* off the Kenya coast: evidence for definite spawning seasons in a tropical fish.

Legal Note: Kenya

Keywords: Gonad maturation, seasonality, maturity stages, *Siganus sutor*

Abstract: The gonad maturation cycle of *Siganus sutor* (Valenciennes, 1835) (Osteichthyes-Siganidae) is described for both males and females using macroscopic criteria for the testes and both macroscopic and microscopic ones for staging the ovaries. *Siganus sutor* has two major spawning seasons: one in January/February and the other in May/June. The presence of these seasons is established by (a) the temporal variations in the condition factor and in the relative weight of the gonads, (b) the progression of peaks of maturity stages with seasonal occurrence of spent fish in the samples, and (c) the seasonal appearance of juveniles. This is a significant result for a tropical marine fish.

Notes: 6334

'File' Attachments: internal-pdf://Ntiba Gonad-1963473920/Ntiba Gonad.pdf

Language: English

Reference Type: Book Section

Record Number: 335

Author: E. N. Okemwa

Year: 1998

Title: Enhancement of productivity through research in eastern Africa region: the experience of the Kenya Marine and Fisheries Research Institute (KMFRI).

Book Title: Advances in marine science in eastern Africa: application of scientific knowledge in marine and coastal resources management.

City: Mombasa

Publisher: KMFRI

Pages: pp. 21-23

Series Title: Advances in marine science in eastern Africa: application of scientific knowledge in marine and coastal resources management.

Short Title: Enhancement of productivity through research in eastern Africa region: the experience of the Kenya Marine and Fisheries Research Institute (KMFRI).

Section: Kneya

Abstract: Kenya has made significant strides in providing fish to the people since its independence in 1963. The process of revising the national fish production policy to include national aquaculture research with linkages among researchers, policymakers and the community, is in its very early stages. A poor economy dims the prospect of increased government funding for this effort, particularly since aquaculture research has yet to be seen as an essential tool for the success of the industry. External funding will be necessary for some time in order to establish a research base that effectively addresses the needs of both policy-makers and the community. As awareness on aquaculture research increases, along with co-operation among the relevant parties, it is hoped that government support will increase in terms of making better use of research results as well as providing financial support.

Notes: 6335

'File' Attachments: internal-pdf://Okemwa21-3732542464/Okemwa21.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 336

Author: R. M. Nzioka

Year: 1984

Title: The evaluation of marine fisheries resources in Kenya

Book Title: Proceedings of the Norad-Kenya

Publisher: KMFRI; FAO

Pages: pp 27-32.

Series Editor: K. FAO

Short Title: The evaluation of marine fisheries resources in Kenya

Section: Kenya

Abstract: The Marine Fisheries of Kenya are supported by pelagic and demersal fish species which are exploited by various crafts and gears. The fishing industry is passing through a phase of changing over from traditional to the modern methods of exploitation, from the use of indigenous sailing crafts and rather less effective gears to mechanised crafts and the larger powered vessels operating with more efficient types of fishing gears and other auxiliary equipment such as radar, fish finders etc. Exploration and harvesting of the Kenya fisheries resources of the ocean and more intensive applied fisheries research is of considerable

importance to the country. The objectives of this paper are to present a brief account of the recent findings on the seasonal distribution of the major exploited marine fishery resources, potential resources available for exploitation and on the influence of the monsoons on the availability of fisheries resources. The ecological relationship between fishes and their environment is of great practical application in fisheries. For any large-scale development of our fishery resources a better understanding of the environmental factors influencing the resources is essential. The marine biological and oceanographic investigations in recent years have provided very interesting information of biological and non-biological factors of the environment. Non-biological factors influencing the fisheries include winds, monsoons, currents, nature of bottom, light, temperature, salinity, nutrients, etc. The influence of the Southwest Monsoon on the surface waters is manifested by lowering the thermocline, along the East African Coast. It has been found that the monsoon intensities have direct influence on the fisheries. In view of this it is desirable to discuss the fluctuations in fisheries.

Notes: 6336

'File' Attachments: internal-pdf://THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA-0220435716/THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA.mht

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 337

Author: G. Van der Velde, F. Dehairs, S. Marguillier, G. K. Mwatha, R. L. Op't veld, S. Rajagopal and P. H. Van Avesaath

Year: 1995

Title: Structural and stable isotope differences in the fish communities of mangrove creeks, seagrass meadows and sand flats in Gazi Bay (Kenya)

Book Title: Interlinkages between eastern-African coastal ecosystems.

Pages: pp. 138-156.

Short Title: Structural and stable isotope differences in the fish communities of mangrove creeks, seagrass meadows and sand flats in Gazi Bay (Kenya)

Section: Kenya

Abstract: An elaboration of findings of the Netherlands Indian Ocean (NIOP) and STD III programmes were conducted with the main objective of comparing species composition, abundance, biomass and size ranges of different fish species in the mangrove creeks, seagrass meadows and flats of Gazi Bay, Kenya. Various fishing techniques were used to describe the community structure of the fish assemblages. A total of 3375 individuals representing 54 families and 162 species were collected from Gazi bay, which were far higher as compared to other studies in tropical, sub-tropical and temperate regions. Intertidal seagrass beds harboured the highest number of species and also depicted highest diversity. Approximately 90% of the length classes of fishes recorded indicated sub-adults and juveniles. The diversity indices H' and J' were found to be different for the different zones in the bay. Shannon-Wiener diversity index (H') ranged from 2.22 to 3.18, while the highest Pielou evenness index (J') was

observed to be 0.85 and lowest 0.65. delta super(15)N indices indicate clear distinction between piscivore and herbivore fishes in the case of *Sphyraena barracuda* and *Siganus sutor* while delta super(13)C values indicated seagrass beds as the main foraging grounds. Clustering of the catch data indicate that fish assemblage of seagrass beds near the mangroves differ in species composition from those in the bay. The predator-prey relationships may play an important role in structuring of the fish assemblages of the seagrass beds.

Notes: 6337

'File' Attachments: internal-pdf://Van_der_Velde-0964190208/Van_der_Velde.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 338

Author: T. R. McClanahan, A. T. Kamakuru, N. A. Muthiga, M. G. Yebio and D. Obura

Title: Coral reef restoration: Effect of sea urchin reductions on algae, coral and fish assemblages.

Journal: Conservation Biology

Volume: 10

Pages: 136-154

Type of Article: Journal Article

Short Title: Coral reef restoration: Effect of sea urchin reductions on algae, coral and fish assemblages.

Legal Note: Kenya

Abstract: Many heavily fished coral reefs have a high abundance of sea urchins that may suppress the recovery of fish and coral populations once fishing effort is reduced or eliminated. Restoration of these reefs may be accelerated by intervening and reducing sea urchin populations—particularly those of long-lived species. We studied three Kenyan coral-reef lagoons to determine the influence of reductions in sea urchin populations on coral, algae, and fish populations. Populations were monitored seven times over a 1-year period in 50 × 50 m unmanipulated control plots and experimental sea urchin reduction plots where sea urchin populations were reduced by about 85%. Census of the most-abundant fish families found the greatest positive population responses to sea urchin reduction in plots protected from fishing. The wet weights of fish nearly tripled, population density increased by 65%, and species richness increased by 30% compared with adjacent control plots. Parrotfish, wrasse, scavenger, and snapper families showed the greatest population and wet-weight increases. In the two fished reefs, fish populations also increased but to a lesser degree than in the unfished reef—particularly when comparing the wet-weight estimates of fish. Small-bodied species of the damselfish and wrasse families and juvenile parrotfish exhibited the largest population increases in these fished reefs. In fished reefs algae and seagrass cover exhibited the greatest increases following sea urchin reduction. Seagrass colonized bare sand, whereas fleshy brown algae colonized hard substrate (dead coral). The tall canopy-forming alga *Sargassum latifolium* became the dominant alga in the fished reefs, whereas the more prostrate genus *Padina* dominated in the unfished reef. Fleshy algae cover in the unfished reef was about half that of the two fished reefs—attributable to the greater abundance of parrotfish in the unfished reef.

This suggests that greater herbivory in the unfished reef kept the algae from reaching an algal forest climax typified by *Sargassum* dominance. In the fished reefs the high *S. latifolium* cover and the increased thickness of the algal turf reduced hard coral cover by around 30%. In the unfished reef coral cover was reduced by around 13%, but by the end of the experiment coral cover and genera richness were the same in both the control and the sea urchin reduction plots. We conclude that, primarily, fishing and, secondarily and indirectly, high sea urchin abundance are reducing fish numbers and diversity in Kenyan reefs and that sea urchin reduction has the potential to increase reef fisheries production and recovery from overfishing. Sea urchin reduction is not recommended, however, on moderately fished reefs due to the possible loss of coral cover and diversity. If reefs are either severely degraded or if fishing effort is reduced or eliminated, then sea urchin reduction is recommended for the restoration of fish numbers, feeding importance, species diversity, and fisheries production.

Notes: 6338

'File' Attachments: [internal-pdf://2386952\[1\]-3509741313/2386952\[1\].pdf](internal-pdf://2386952[1]-3509741313/2386952[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 339

Author: T. R. McClanahan

Year: 1997

Title: Fish Critical to Coral Reefs.

Journal: Wildlife Conservation

Volume: 100

Issue: 1

Pages: 8

Type of Article: Journal Article

Short Title: Fish Critical to Coral Reefs.

ISSN: 1048-4949

Legal Note: Kenya

Abstract: Ocean scientists and ecologists have concluded that human overfishing is extremely damaging to the world's coral reefs, as a shortage of fish upsets the ecobalance in the reef's environment. A team of coral reef ecologists from the University of Miami and the Wildlife Conservation Society studied reefs in Malindi National park in Kenya and in Watamu, and concluded that the high levels of fish in Malindi were preventing the buildup of toxic sediments in the reef.

Notes: 6339

Language: English

Reference Type: Report

Record Number: 340

Author: M. J. Sanders, S. G. Gicheru and R. M. Nzioka

Year: 1990

Title: Report of Kenya marine fisheries sub-sector study. FAO Assistance to the Government of Kenya in Carrying Out a Fisheries Sector Study and Formulating a Development Plan.

City: Mombasa

Institution: KMFRI

Series Volume: no. 64

Pages: 44 pp.

Publisher: S. D. D. O. S. D. D. OISO]

Type: Report

Short Title: Report of Kenya marine fisheries sub-sector study. FAO Assistance to the Government of Kenya in Carrying Out a Fisheries Sector Study and Formulating a Development Plan.

Keywords: Fishery development Fishery policy Fishery resources Marine fisheries Socioeconomic aspects

Abstract: The document reviews the marine fisheries sub-sector of Kenya (excluding tuna fisheries). It was prepared as a contribution to a review of the whole sector, a first step in the process of FAO assistance in the preparation of a plan for the development and management of fisheries in the country. After a brief introduction to the fisheries resources in the country the document reviews the government policy, the interventions and the fishermen cooperatives. Constraints and conflicts to further development of the marine fisheries sector are reported: they are those imposed by the limited resources. Already the artisanal fishery and the shallow water shrimp fishery appear to be fully exploited. The potential resources, not yet subjected to exploitation, are modest in size and include a) the deep sea lobster and shrimp; b) the demersal trawl fish; c) the demersal species on the North Kenya Bank. The exploitation of these resources would require relatively large scale investments. The need of appropriate management plans for the future of the fisheries sector is underlined.

Notes: 6340

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 341

Author: M. Samoilys

Year: 1988

Title: A Survey of the Coral Reef Fish Communities on the Kenyan Coast

City: Mombasa

Institution: KMFRI

Document Number: WWF Project no. 3739 (Technical Report Prepared for The Ministry of Tourism and Wildlife)

Publisher: KMFRI

Short Title: A Survey of the Coral Reef Fish Communities on the Kenyan Coast

Keywords: Abundance Biomass Coral reefs Echinoderm fisheries Fishery regulations Reef fisheries Resource conservation Silting Species diversity

Abstract: Underwater censuses were used to measure species richness, abundance, and biomass of coral reef fish at nineteen reefs slope study sites on the Kenyan coast, in 1987/1988. The survey was designed to examine the structure of the coral reef fish communities in relation to protection, fishing, sediment run-off from rivers, sea urchins, and collecting for the aquarium

trade. A further twelve reefs were studied, but no censuses were carried out due to poor visibility or lack of coral substrate. While species richness was highest in Marine National Parks where no fishing or collecting is allowed, the same was not true for fish abundance, or for biomass of commercially important fish. Some of the highest densities and weights of fish were recorded from marine National Reserves where traditional fishing methods are allowed. Standing stocks (biomass) of commercially important fish were negatively correlated with fishing intensity, and localized overfishing was evident near centres of high human populations. On the sparsely populated northern coastline, non-coralline reefs support exceptionally high standing stocks, due to minimal fishing pressure, and possibly a greater input of nutrients. Areas with higher fishing intensities had smaller standing stocks but not comparably smaller abundances. This suggests that more intense fishing is reducing average fish size. In general, the results indicate that overfishing is not a major problem on Kenya's reefs slopes. Two factors, siltation from rivers and dynamite 'fishing' has a major impact on the fish communities. Reefs badly damaged from dynamiting in the Shimoni area, including Mako Kokwe in the Kisite Marine National Park, have negligible amounts of living hard coral and are characterized by a low species richness of fish, and exceptionally low densities of fish.

Notes: 6341

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article

Record Number: 342

Author: E. O. Wakwabi

Year: 1986

Title: Sardine fishery in Kenya

Magazine: Kenya Aquatic Bulletin

Place Published: Kenya Aquatic Bulletin

Publisher: Kenya Aquatic Bulletin

Volume: 3

Pages: pp. 22-27

Short Title: Sardine fishery in Kenya

Abstract: This paper gives an overview on the Kenya sardine fishery as a research area for the future development and management of marine resources. The fishery is viewed in the context of an industry and the need for research into it as an ecological indicator and for commercial exploitation is emphasized.

Notes: 6342

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Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 343

Author: S. J. Grove, M. C. Little and P. J. Reay

Year: 1985

Title: Tudor Creek Mombasa, The life-history stages of the fish and prawns.

City: Mombasa

Institution: KMFRI

Document Number: ODA Research Project R 3888:

Pages: 135pp

Publisher: O. R. Project

Short Title: Tudor Creek Mombasa, The life-history stages of the fish and prawns.

Abstract: The project was based at Kenya Marine and Fisheries Research Institute (KEMFRI) headquarters in Mombasa, (Kenya) with Tudor creek as the study area. Sampling mainly involved the use of plankton nets and fine-meshed beach seines. Sampling frequencies of hours, days and weeks were also employed in order to cover the diel, circatidal, semilunar and lunar cycles. From the samples, prawn post-larvae, fish eggs and larvae, and juvenile fish and prawns were sorted, identified, and counted in order to provide data on their occurrence, distribution and abundance. Records of temperature, and some other abiotic parameters, were also maintained. The fish and prawn fauna of Tudor Creek, is described. Results are discussed in relation to the literature available on similar ecosystems in other tropical areas, and in relation to the the major problems encountered in carrying out the work. It is concluded that much has still to be learned about the role of mangrove creeks as nursery areas, and also that this role is important in the context of future fisheries management and environmental monitoring.

Notes: 6343

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 344

Author: R. M. Nzioka

Year: 1984

Title: The evaluation of marine fisheries resources of Kenya

Journal: Kenya Aquatica Bulletin

Issue: 2

Pages: 20-25

Short Title: The evaluation of marine fisheries resources of Kenya

Legal Note: Kenya

Abstract: A brief account is presented of findings regarding the seasonal distribution of the major exploited marine fishery resources in Kenya. Potential fishery resources and influence of the monsoons on the availability of the fisheries resources are also examined.

Notes: 6344

'File' Attachments: internal-pdf://Nzioka_20-0135318016/Nzioka_20.pdf

Language: English

Reference Type: Magazine Article

Record Number: 345

Author: S. O. Allela

Title: An overview of Fisheries Management, Research and development

Magazine: Aquatica Bulletin

Place Published: Mombasa

Publisher: Kenya Marine and Fisheries Research Institute

Volume: 1

Pages: 18-22

Short Title: An overview of Fisheries Management, Research and development

Abstract: Fisheries management essentially involves the making of decisions on how resources can be harvested, and in this context fisheries research can be regarded as a tool for management which will enable those charged with making decisions and formulating policies to ensure control or adjustment of the fishing operation, purposely brought into play in order to optimize the use of the fishery resources. In a way, the development, research and management are three aspects which serve the same process, the utilization and exploitation of the resources. Opportunity for management strategies are varied, and this paper discusses the biological approach to fishery development and management.

Notes: 6345

'File' Attachments: internal-pdf://Allela_18-1543765248/Allela_18.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 346

Author: S. O. Allela

Title: History and development of fish culture.

Journal: Kenya Aquatica

Issue: 1

Pages: 27-31

Type of Article: Journal Article

Short Title: History and development of fish culture.

Legal Note: Kenya

Abstract: Following a brief historic account of fish culture, the development of fish culture, especially in African countries, is discussed.

Notes: 6346

'File' Attachments: internal-pdf://Allela_27-0855927808/Allela_27.pdf

Language: English

Reference Type: Report

Record Number: 347

Author: T. Johnsen

Year: 1983

Title: Commercial trawling for fish and deep sea lobster (*Puerulus* spp.) off Somalia.

City: Mombasa
Institution: KMFRI
Pages: 47 pp
Publisher: KMFRI
Type: SWIOP-DOC.

Short Title: Commercial trawling for fish and deep sea lobster (*Puerulus* spp.) off Somalia.

Abstract: A summary is presented of information collected on a 40 day trawling cruise which investigated the demersal fish and deep-sea lobster off Somalia. Vessel and gear specifications and charts showing the grounds utilized for trawling in Somalian waters are given, and descriptions made of the areas and taxa dominating the catches from the different areas. An estimate of the standing stocks of 2 species of deep-sea spiny lobsters, *Puerulus carinatus* and *P. sewellii* is also presented.

Notes: 6347

'File' Attachments: internal-pdf://255099-2496044288/255099.mht

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 349

Author: T. F. DeSouza

Year: 1981

Title: A literature review of research on the demersal fish resource of East Africa.

Conference Name: Proceedings of the workshop of the KMFRI on Aquatic Resources of Kenya

Conference Location: Mombasa, Kenya

Publisher: KMFRI

Pages: pp. 84-108.490p

Date: July 13-19,

Pub Place: Kenya

Abstract: The literature on past research on the biology, ecology and exploitation of the demersal fish resources of the East Africa region is reviewed with a view to pinpointing areas where future research ought to be concentrated on. It has been noted that there exists a paucity of information on most aspects of the demersal resource. Areas of priority are identified as stock assessment studies of the demersal trawl fishery and the reef fisheries.

Notes: 6349

'File' Attachments: internal-pdf://De Sousa_84-108-2903247616/De Sousa_84-108.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 350

Author: J. E. Randall and A. Edwards

Year: 1984

Title: A new Labrid fish of the Genus *Thalassoma* from the Pitcairn Group, with a review of

related Indo-Pacific species.

Journal: Journal of Agriculture & Aquatic Sciences

Volume: Vol. IV

Issue: No. 2.

Short Title: A new Labrid fish of the Genus *Thalassoma* from the Pitcairn Group, with a review of related Indo-Pacific species.

Legal Note: Kenya

Abstract: *Thalassoma heiseri* n.sp. and related species of the Indo-Pacific are discussed.

Notes: 6350

Language: English

Reference Type: Conference Paper

Record Number: 351

Author: W. H. Brakel

Year: 1981

Title: Alteration and destruction of coastal habitats: Implications for marine fisheries.

Conference Name: Proc. Workshop on Aquatic Resources of Kenya Kenya Marine and Fisheries Research Institute and Kenya National Academy for Advancement of Arts and Science. .

Conference Location: Kenya

Publisher: KMFRI

Pages: pp 247-255

Date: July 13-19

Pub Place: Kenya

Abstract: Studies from other tropical regions have shown that marine fish abundance and production and marine fisheries yields are closely linked to the productivity of coastal and shoreline habitats such as coral reefs, seagrass beds, mangrove swamps and estuaries, even if the fish populations are found and exploited a considerable distance from these habitats. The successful management of Kenya's marine fisheries will require detailed knowledge of basic ecological processes in coastal habitats and their implications for fish stocks. Efforts to halt the continued degradation and destruction of these habitats should be intensified.

Notes: 6351

'File' Attachments: internal-pdf://Brakel_247-255-2231714048/Brakel_247-255.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Thesis

Record Number: 352

Author: R. M. Nzioka

Year: 1981

Title: Biology and fishery of the reef fish *Scolopsis bimaculatus* Ruppel in Kenya

City: Nairobi

University: University of Nairobi

Degree: M.Sc

Thesis Type: M.Sc Thesis.

Short Title: Biology and fishery of the reef fish *Scolopsis bimaculatus* Ruppel in Kenya

Abstract: The biology, food and feeding habits of the reef fish *Scolopsis bimaculatus* (Paragunda), which is widely distributed in the East African Coast, is studied. The study provides knowledge needed to manage the stocks properly and avoid overfishing. *S. bimaculatus* is a carnivore feeding mainly on crustaceans, molluscs, echinoderms and fishes. The feeding intensity is great during July, August, October, December and May, and coincides with the resting period after spawning. Though the species feeds on fishes almost throughout the year, penaeid prawns form one of the main constituents followed by molluscs and echinoderms.

Notes: 6352

'File' Attachments: internal-pdf://Nzioka_MSc-0856049152/Nzioka_MSc.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 353

Author: R. M. Nzioka

Year: 1979

Title: Observations on the spawning seasons of East African reef fishes.

Journal: Journal of Fish Biology

Volume: Vol. 14

Issue: no. 4 pp

Pages: 329-342.

Short Title: Observations on the spawning seasons of East African reef fishes.

Legal Note: Kenya

Keywords: commercial species coral reefs stock assessment spawning seasons Pisces ISW, Africa

Abstract: Between 1974-1977 the gonads of a number of commercial reef fishes were examined during a study of gear improvement and stock assessment along the East Africa coastal waters. Different methods of fishing ranging from modern methods of trawling to local methods of traps were used. Twenty-one families with a total of 73 species were examined. The spawning of these species occurred throughout the year with 2 peaks in Jan to March and Sept to Nov. The highest peak of breeding was in Oct, corresponding to the time of the South East Monsoons, and to the highest water temperature

Notes: 6353

'File' Attachments: internal-pdf://Nzioka-1979-fish biol-1560808448/Nzioka-1979-fish biol.pdf

Language: English

Reference Type: Journal Article

Record Number: 354

Author: G. R. Forster, J. R. Bacock, M. R. Longbottom, N. R. Merrett and K. S. Thomsom

Year: 1970

Title: Results of the Royal Society, Indian Ocean Deep Slope Fishing Expedition 1969

Journal: Proceedings of the Royal Society of London

Volume: 175

Pages: 367-404

Short Title: Results of the Royal Society, Indian Ocean Deep Slope Fishing Expedition 1969

Legal Note: Kenya

Abstract: During a 6-wk Royal Society Expedition in the western Indian Ocean 638 fishes were caught on drop lines worked chiefly at night at depths between 100 and 1000 m. Many of the spp caught were rare or unrecorded from the area. The primary aim of the Expedition, to find specimens of the coelacanth *Latimeria* and thereby extend its known range, was not fulfilled. One teleost, the lutianid *Etelis marshi*, and a squaloid shark, *Centrophorus* sp, were particularly common, accounting for 60 per cent of the total catch; the remainder comprised 24 teleost and 11 elasmobranch spp. Details are given of the itinerary, the fishing gear, fishing methods and the individual spp caught, together with a brief discussion on the effect of depth, height of hooks above the sea floor and geographical position on the composition of the catches.

Notes: 6354

Language: English

Reference Type: Book

Record Number: 355

Author: J. Robinson, M. Samoilys and P. Kimani

Year: 2008

Title: Reef Fish Spawning Aggregations in the Western Indian Ocean: Current Knowledge and Implications for Management

Pages: 263-276

Short Title: Reef Fish Spawning Aggregations in the Western Indian Ocean: Current Knowledge and Implications for Management

Abstract: Studies of reef fish spawning aggregations are new to the Western Indian Ocean. Compared to other regions. This paper reviews the current state of knowledge of spawning aggregations in the region and assesses their implications for fisheries management and conservation. Fisher knowledge has identified more than 30 species of reef fish that aggregate to spawn, mainly belonging to the families Lutjanidae, Serranidae, Lethrinidae and Siganidae. Verification has been achieved for 25 spawning aggregations from 7 species, including five and six aggregations of *Epinephelus fuscoguttatus* and *Siganus sutor*, respectively. Reef fishes commonly spawn within the northeast (November-April) and inter-tropical monsoon periods. Serranid aggregation sites include reef passes, channels, reef slopes and pinnacles, while *Siganus sutor* spawns on patch reefs and granitic reefs. The status of spawning aggregations is poorly known and evidence of aggregation collapses are currently confined to Seychelles. Few spawning aggregations are protected in the region and their applicability to new approaches of managing for resilience will not be realised without considerable efforts in research and advocacy. The management of spawning aggregations through marine protected areas does not constitute a solution for fisheries management and must be viewed as complementary to tools such as catch and effort controls.

Notes: 6355

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Book

Record Number: 356

Author: G. W. Maina, D. Obura, H. Alidina and B. Munywoki

Year: 2008

Title: Increasing Catch in an Over-exploited Reef Fishery: Diani-Chale, Kenya, from 1998 to 2006

Pages: 309-320

Short Title: Increasing Catch in an Over-exploited Reef Fishery: Diani-Chale, Kenya, from 1998 to 2006

Abstract: Data were collected in southern Kenya on coral reef ecosystems and fisheries to assess the influence of the 1998 coral bleaching and mortality event. We compared benthic cover, sea urchin and fish abundance in unfished marine parks and fished reefs and the reef-associated fisheries 3 years before and after 1998. Hard and soft coral decreased while coralline algae increased in both management areas. Turf increased in marine parks and sponge and fleshy algae increased in the fished reefs. Sea urchin grazer biomass was unchanged over this period and the fish community changed less than benthic cover. In general, butterflyfish, damselfish and wrasses were negatively influenced while surgeonfish and a few uncommon families were positively influenced by the substratum change. There was a 17% increase in fishing effort as measured by fishermen per day at each landing site and the total demersal catch declined by 8% and the catch per man declined by 21% after 1998. The decline in the total catch and CPUE combined with the increase in effort suggest an overexploited fishery and this makes it difficult to distinguish changes caused by coral mortality or fishing effort. The price of fish increased over this period and this caused an 18% increase in the total value of the fishery but no difference in the net income of individual fishermen

Notes: 6356

URL: 6.03%20MAINA%20ET%20AL%202008[1].pdf

'File' Attachments: internal-pdf://Maina-2078747648/Maina.pdf

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Book Section

Record Number: 357

Author: P. Tuda, W. Nyaga, G. W. Maina, I. Wanyonyi and D. O. Obura

Year: 2008

Title: Estimating Total Fishing Effort over Tidal to Annual Periods in the Diani-Chale-Gazi Reef Fishery in Kenya

Editor: D. O. T. Obura, J. Linden, O. (Ed)

Book Title: Ten Years after bleaching – facing the consequences of climate change in the Indian Ocean. Cordio Status Report 2008. CORDIO (Coastal Oceans Research and Development in the Indian Ocean)/Sida-Sarec. Mombasa

Publisher: CORDIO

Series Volume: Cordio Status Report 2008.

Pages: pp. 321-334

Series Editor: D. O. T. Obura, J. Linden, O. (Ed)

Series Title: Cordio Status Report

Short Title: Estimating Total Fishing Effort over Tidal to Annual Periods in the Diani-Chale-Gazi Reef Fishery in Kenya

Section: Kenya

Abstract: The Diani-Chale area of the southern Kenya coast has been the subject of considerable fisheries research and management for over 2 decades, however a detailed estimate of fishing effort is not yet available. A seasonal census of fishers and activity patterns was held from 2003 to 2006, to capture variability by tide, lunar phase and season in fishing effort by all local gear types. The confluence of religious and lunar/tidal calendars results in a very strong cyclical pattern in fishing, with low tides during the full moon spring phase in the northeast monsoon being the preferred time for fishing and half moon neap phase in the southeast monsoon the least preferred. On average, daily fishing effort was 27.3 ± 8.9 to 42.3 ± 6.6 fishers at each landing site, in the SEM and NEM, respectively. Over a full year this exerts a pressure of 85,551 fisherdays in Diani-Gazi. The total fisher population is estimated at 570 fishers, and the total annual catch, based on gear-specific catch rates is estimated at 403 tonnes. Both spearguns and beach seines are illegal gears in Kenya but between them they support 37% of fishers in the NEM and 57% in the SEM in the study area. Spearguns alone account for 33% of the total fishery. Based on their importance and current knowledge on impacts of these gears it is recommended that beach seine regulation be strengthened and rationalized, but that the social importance and limited evidence for damaging effects of spearguns will require softer regulations to reduce their prevalence but not eliminate them totally. Extrapolated to the national level, recognizing many limitations in doing this, these results from Diani- Gazi suggest the national artisanal fishery employs almost 23,000 fishers catching over 16,000 tonnes of fish annually. Both figures are 2-3 times higher than officially reported levels of 10,000 fishers and 5-7,000 tonnes/year, respectively.

Notes: 6357

'File' Attachments:

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Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 358

Author: Oluoch, J. Stephen and D. Obura

Year: 2008

Title: Assessment of Fisherfolk Organizations and Beach Management Units (BMU) in the Management of Fishery Resources in Diani-Chale, Southern Kenya

Editor: D. O. Obura, Tamelander, J., & Linden, O. (Ed)

Book Title: Ten Years after bleaching – facing the consequences of climate change in the Indian Ocean. Cordio Status Report 2008. CORDIO (Coastal Oceans Research and Development in the Indian Ocean)/Sida-Sarec. Mombasa

City: Mombasa

Publisher: CORDIO

Series Volume: Cordio Status Report 2008.

Pages: 335-343

Series Editor: D. O. Obura, Tamelander, J., & Linden, O. (Ed)

Short Title: Assessment of Fisherfolk Organizations and Beach Management Units (BMU) in the Management of Fishery Resources in Diani-Chale, Southern Kenya

Section: Kenya

Abstract: The Diani Chale fishery at the Kenyan coast is facing intense pressure of over-exploitation by communities living along the coastline. Fishing is the main source of livelihood to many families and unregulated exploitation of the resource would impact negatively on thousands of families. The Fisheries Department has the mandate to manage fisheries resources; however the conventional top-down approach in implementing government policies has not succeeded in regulating coral reef fisheries and preventing overexploitation. Consequently, the government has designated Beach Management Units (BMUs) as a mechanism to involve fishers in co-management of fisheries, requiring fishers at a landing site to take on many management roles. The study examines the ability of existing fisher groups and organizations in areas of group membership, election of officials, financial resources and accountability to determine how well prepared fishers are to function as BMUs. Groups were found to have very low levels of transparency and accountability, and mismatched priorities between officials and members. Though fishers see themselves as poor and look to external agencies to provide funding, 82% of the resources the groups utilize come from internal sources and suggest much greater levels of independence than they recognize. The gaps between the expectations in the BMU regulations and the capacity of fisher folk are highlighted and some of the capacity building needs and recommendations for implementing BMU regulations in Diani-Chale are provided.

Notes: 6358

'File' Attachments:

internal-pdf://cordio_status_report_part_2[1]-4144171265/cordio_status_report_part_2[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 359

Author: B. O. Munywoki, D. Maina, G.W.

Year: 2008

Title: Development of a Web-based Geographic Information System as a Decision Tool to Support Fisheries Science and Management: A Case Study of Diani-Chale, Kenya

Editor: D. T. Obura, J Linden, O (Ed)

Book Title: Ten Years after bleaching – facing the consequences of climate change in the Indian Ocean. Cordio Status Report 2008. CORDIO (Coastal Oceans Research and Development in the Indian Ocean)/Sida-Sarec

City: Mombasa

Publisher: CORDIO

Series Volume: Cordio Status Report 2008

Series Editor: D. T. Obura, J Linden, O (Ed)

Short Title: Development of a Web-based Geographic Information System as a Decision Tool to Support Fisheries Science and Management: A Case Study of Diani-Chale, Kenya

Section: Kenya

Abstract: By treating many spatial components simultaneously GIS technologies provide opportunities to integrate and use large amounts of information in simple visual graphics to assist in managing natural resources. A spatial perspective can be useful in a fisheries context to suggest prospective management measures to resource managers. Here we present artisanal fishery data in a novel GIS-enabled format. Data was collected through a participatory monitoring programme in the Diani-Chale area of southern Kenya from 1997 to 2007. Analyses were conducted to provide spatial and temporal statistics on fishing sites, total catches, catch per unit effort (CPUE), catch composition and benthic attributes. Data was organized in ArcGIS and uploaded using HTML scripting onto a web based Internet Map Service (IMS) platform, ESRI's ArcIMS. This enables a user to view the GIS through a standard internet/web browser or ESRI client application, such as ArcGIS or ArcExplorer/ArcReader. Users are able to query, search, pan, zoom and identify any geospatial data layers for display. With the database installed on a personal computer, users can also add data layers and annotate their version to suit their purposes. The database is provided on an accompanying CD-ROM as well as on an 'esite' on CORDIO's website (www.cordioea.org). The interactive provision of spatial datasets is being done to promote information sharing among marine resource scientists and managers and to test emerging technologies in assisting accurate and informed decision-making.

Notes: 6359

'File' Attachments:

internal-pdf://cordio_status_report_part_2[1]-2466769921/cordio_status_report_part_2[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 360

Author: H. O. D. Mirera

Year: 2008

Title: In the Face of Poverty Mangrove Wetlands are Lifelines: Viability Indicators in Silvofishery Initiatives along the Kenyan Coast Assessing Polyculture of Milkfish (*Chanos chanos*) and Mulletts (*Mugil mugil*)

Editor: D. T. Obura, J Linden, O (Ed)

Book Title: Ten Years after bleaching – facing the consequences of climate change in the Indian Ocean. Cordio Status Report 2008. CORDIO (Coastal Oceans Research and Development in the Indian Ocean)/Sida-Sarec

City: Mombasa

Publisher: CORDIO

Series Volume: Cordio Status Report 2008

Pages: pp. 419-431

Short Title: In the Face of Poverty Mangrove Wetlands are Lifelines: Viability Indicators in Silvofishery Initiatives along the Kenyan Coast Assessing Polyculture of Milkfish (*Chanos chanos*)

and Mulletts (*Mugil mugil*)

Section: Kenya

Abstract: Milkfish (*Chanos chanos*) have been grown in polyculture with mullets (*Mugil cephalus*) in marine coastal ponds to increase productivity by more efficiently utilizing ecological resources within an aquatic environment and reduction of risks. Little attempts have been made to culture the two together in East Africa. The study was aimed at identifying the growth rate of milkfish and mullets during the wet (long rains) and dry seasons (short rains) in Kenya; assess variability in pond water quality during peak spring and neap tides; and, assess milkfish and mullet fingerling occurrence over the year. The culture was done in three earthen ponds (each 0.018ha) constructed in the sandy flat behind the mangrove forest, in Kwetu and Majaoni, Mtwapa creek, and Makongeni, Gazi bay. The first culture cycle was July–December 2005 (dry-short rains) and second culture cycle being March–August 2006 (wet-long rains). Stocking was done at 4 fish/m² and a polyculture ratio of 5 milkfish: 1 mullet with an organic manure fertilization (poultry manure) of 25kg in sacks floated on the pond and replaced after every three weeks. Fish sampling was done once every month. Basic water quality parameters (temperature and oxygen) were measured twice a week while other water parameters and nutrient analysis were done four times during the experimental period at peak neap and spring tides. Milkfish and mullet fingerling collection was done for six days in a month during spring tide using a “mosquito-mesh” seine net and push net along the mangrove channels where the water remains stagnant at low tide and during the incoming water. One way ANOVA indicated that milkfish growth rate was significantly lower in wet (0.52 ± 0.18 g/day) than dry (1.21 ± 1.0 g/day) seasons ($P < 0.001$), and similarly for mullet between wet and dry (0.15 ± 0.04 vs. 0.29 ± 0.15 g/day, $p < 0.05$). Pond water temperature varied between 27.1 ± 1.3 to 31.2 ± 2.1 °C (morning and evening respectively) during dry season and 25.7 ± 1.2 to 28.2 ± 1.9 °C in the wet season. Fingerling availability in 2005 - 2006 was analysed with repeated ANOVA and indicated significant difference in milkfish ($P < 0.001$) and mullet ($P < 0.001$) abundance between months; the occurrence of the two fish species also differed significantly at $P < 0.001$.

Notes: 6360

'File' Attachments:

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Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 361

Author: T. R. McClanahan

Year: 1994

Title: Kenyan coral reef lagoon fish: Associations with reef management, complexity, and sea urchins.

Journal: Coral Reefs

Volume: 13

Pages: 231-241

Short Title: Kenyan coral reef lagoon fish: Associations with reef management, complexity, and

sea urchins.

Legal Note: Kenya

Abstract: Population density, number of species, diversity, and species-area relationships of fish species in eight common coral reef-associated families were studied in three marine parks receiving total protection from fishing, four sites with unregulated fishing, and one reef which recently received protection from fishing (referred to as a transition reef). Data on coral cover, reef topographic complexity, and sea urchin abundance were collected and correlated with fish abundance and species richness. The most striking result of this survey is a consistent and large reduction in the population density and species richness of 5 families (surgeon fish, triggerfish, butterflyfish, angelfish, and parrotfish). Poor recovery of parrotfish in the transition reef, relative to other fish families, is interpreted as evidence for competitive exclusion of parrotfish by sea urchins. Reef substrate complexity is significantly associated with fish abundance and diversity, but data suggest different responses for protected versus fished reefs, protected reefs having higher species richness and numbers of individuals than unprotected reefs for the same reef complexity. Sea urchin abundance is negatively associated with numbers of fish and fish species but the interrelationship between sea urchins, substrate complexity, coral cover, and management make it difficult to attribute a set percent of variance to each factor - although fishing versus no fishing appears to be the strongest variable in predicting numbers of individuals and species of fish, and their community similarity. Localized species extirpation is evident for many species on fished reefs (for the sampled area of 1.0ha). Fifty-two of 110 species found on protected reefs were not found on unprotected reefs.

Notes: 6361

'File' Attachments:

internal-pdf://CoralReefs13_p231001[1]-3106996481/CoralReefs13_p231001[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 362

Author: F. Williams

Year: 1970

Title: The sport fishery for sailfish at malindi, Kenya, 1958-1968, with some biological notes

Journal: Bulletin of Marine Science

Volume: Vol. 20

Issue: no. 4

Pages: pp. 830-852

Short Title: The sport fishery for sailfish at malindi, Kenya, 1958-1968, with some biological notes

Legal Note: Kenya

Abstract: Statistical data are presented on the sport fishery for sailfish, *Istiophorus platypterus*, at Malindi, Kenya, for the ten seasons, July 1958-June 1968. Effort has remained relatively stable, whilst catch and catch per unit effort have increased rapidly since the 1963-64 season. Catch and size of fish appear mainly independent of events taking place in the sport fishery. Aspects of length-weight relationships, length distributions, and growth are discussed with reference to Atlantic and West Pacific fish. Mean weight of sailfish in the sport and commercial

fisheries is shown to have declined significantly in recent years, almost certainly due to increased fishing pressure exerted on stocks by commercial longliners in the equatorial western Indian Ocean. Migration of sailfish into East African coastal waters is discussed in relation to the environmental conditions. Recommendations are made for continued monitoring of the sport fishery and for future research.

Notes: 6362

'File' Attachments: internal-pdf://Williams-1463438080/Williams.pdf

Language: English

Reference Type: Thesis

Record Number: 363

Author: S. W. Agembe

Year: 2008

Title: Some aspects of the biology and fishery of groupers (teleostei: serranidae) in the inshore waters of south coast, Kenya.

Academic Department: Fisheries Department

City: Eldoret

University: Moi University

Degree: MSc

Thesis Type: MSc Thesis, Kenya

Short Title: Some aspects of the biology and fishery of groupers (teleostei: serranidae) in the inshore waters of south coast, Kenya.

Abstract: The fisheries of groupers have declined worldwide mainly due to fishing pressure on coral reef fishes. Although data on groupers biology are important for management of fisheries, such data are lacking for coastal Kenya. This study therefore aimed at providing biological information on groupers from south coast Kenya. Biological data were obtained from groupers landed by artisanal fishermen at Msambweni, Shimoni and Vanga landing sites from February-July 2007. Specimens were measured for weights, lengths and dissected, sexed and assigned maturity stages. Overall 37 grouper species belonging to 6 genera namely; *Anypiperodon*, *Cephalopholis*, *Dermatolepis*, *Epinephelus*, *Plectropomus* and *Variola* were landed by fishers during the study period. The genus *Epinephelus* was the most speciose with 20 species. There was significant seasonal difference in Shimoni during total numbers of groupers landed in southeast monsoon (SEM = 616) compared to northeast monsoon (NEM = 184) ($\chi^2 = 125.812$, $df = 1$, $p = 0.000$). Gonadal activity of grouper species showed spawning during new moon for *Epinephelus coioides* and full moon phase for *Cephalopholis urodeta*. The monthly percentage number of individuals with ripe gonads was 0.14 % in March, 1.2 % in April, 0.3 % in May, 3.1 % in June and 12.3 % in July. Sex ratios were skewed in favour of females in all species except *Cephalopholis leopardus*, *Epinephelus macrospilos* and *Epinephelus tukula* which were normal. The size frequency distribution results indicated *Epinephelus caeruleopunctatus*, *Epinephelus fasciatus*, *Epinephelus malabaricus* and *Epinephelus coioides* species were landed below their size at first maturity. All length-weight regressions were significant ($p < 0.05$), coefficient of determination (r^2) values ranged from 85.9 % in *Cephalopholis boenak* to 99.3 % in *Epinephelus coioides*. A test of isometry showed the length exponent b values for all species were not significantly different from 3 indicating isometric growth for all groupers species in

this study. A two-sample t-test showed that the mean size of *Cephalopholis boenak* in Shimoni and Vanga was not significantly different ($t = -0.0016$, $df = 123$, $p = 0.494$) whereas *Epinephelus malabaricus* were significantly larger in Shimoni than in Vanga landing sites ($t = -2.613$, $df = 97$, $p = 0.005$). The fisheries landing statistics of groupers showed variation between sites over time with the highest annual landing of 30.4 tons recorded at Vanga in 2004 while the lowest landing of 2.5 tons was landed at Msambweni in 2001. The low catchability of larger sizes of most species suggested that groupers were likely experiencing growth overfishing. The declines in catches were attributed to overfishing and there is therefore need for fisheries management to restrict exploitation of groupers especially during their spawning season.

Notes: 6363

'File' Attachments: <internal-pdf://Agembe-2874836737/Agembe.pdf>

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 364

Author: G. Okemwa, E. Kimani, E. Fondo and N. Wambiji

Year: 2008

Title: Spatial Trends in Kenya's Coastal Inshore Artisanal Fisheries

City: Mombasa

Institution: KMFRI

Publisher: KMFRI

Short Title: Spatial Trends in Kenya's Coastal Inshore Artisanal Fisheries

Keywords: Fish landings, CPUE, seasons

Abstract: This report provides an overview of Kenya's coastal artisanal fisheries based on catch assessment surveys conducted by the Kenya Marine and Fisheries Research Institute in selected landing sites in Vanga, Shimoni, Msambweni, Gazi, Diani and Lamu from 2002 to 2007. Fish landings were recorded, and fisher interviews conducted to monitor seasonal and annual changes in catches. Monsoon seasons were a major driver of seasonal differences in landings, which were higher during the northeast monsoon than during the southeast season. The mean catches also exhibited high variability between fishing grounds which were also influenced by the gear and vessel types used. Catch Per Unit Effort (CPUE) from lema traps at Msambweni, Vanga, Diani show no changes during the study period whereas, catch per unit effort from gill nets increased in Shimoni, Vanga, and Msambweni. However, change in mesh size or operation of the gear used may explain the higher catches in these areas. Fishers in Lamu using handlines landed significantly higher catches compared to those fishing in the southcoast of Kenya. Annual CPUE data also varied from place to place. Fishing effort data needs to be collected to enable estimation of total landings. Distinct management initiatives through ongoing co-management measures are encouraged due to the unique biophysical and socioeconomic characteristics of the different fishing grounds. The information provided here gives a framework for a rapid assessment of artisanal fisheries dynamics at the Kenya coast.

Notes: 6364

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 365

Author: N. Wambiji, J. Ohtomi, B. Fulanda, E. Kimani, N. Kulundu and M. Y. Hossain

Year: 2008

Title: Morphometric Relationship and Condition Factor of *Siganus stellatus*, *S. canaliculatus* and *S. sutor* (Pisces: Siganidae) from the Western Indian Ocean Waters

Journal: South Pacific Studies

Volume: 29

Issue: 1

Pages: 33-46

Short Title: Morphometric Relationship and Condition Factor of *Siganus stellatus*, *S. canaliculatus* and *S. sutor* (Pisces: Siganidae) from the Western Indian Ocean Waters

Legal Note: Kenya

Keywords: condition factor, morphometric relationship, Siganidae, Southcoast Kenya, Western Indian Ocean,

Abstract: The rabbitfishes (Pisces: Siganidae) have long been considered good candidates for aquaculture. Some biological attributes including morphometric relationships (length-length, length-weight) and condition factors of three siganids of the Western Indian Ocean were estimated over peak April-August monsoon season in Southcoast Kenya. Specimens were caught using basket traps "malema", one of the main gears in the traditional fishery. A total of 64, 260 and 736 specimens of *Siganus stellatus*, *S. canaliculatus* and *S. sutor* were recorded, with mean±standard error for total length (TL) as 16.0±0.6cm, 22.5±0.3cm and 26.5±0.2cm with corresponding wet body weights (BW) of 71.28±8.53g, 158.58±6.45g and 258.80±4.30g respectively. TL-BW relationships were best expressed by $\log_{10}BW=2.597\log_{10}TL-1.356$ for *S. stellatus*, $\log_{10}BW=2.800\log_{10}TL-1.635$ for *S. canaliculatus* and $\log_{10}BW=2.716\log_{10}TL-1.484$ for *S. sutor* with relative condition factors expressed by $Kn = BW / [(4.41 \times 10^{-2}) (TL^{2.597})]$, $Kn = BW / [(2.32 \times 10^{-2}) (TL^{2.800})]$ and $Kn = BW / [(3.28 \times 10^{-2}) (TL^{2.716})]$ for the three species respectively. TL and BW were significantly correlated with Kn and K. To the best knowledge of the authors, this study provides the first L-W relationship and Kn data for *S. stellatus* within the species geographical distribution. The overall results and equations provide useful simple tools for in-situ gauging of overall health of wild siganid populations in Southcoast Kenya for fisheries management and assessment of potential aquaculture species.

Notes: 6365

'File' Attachments: internal-pdf://Nina08-1499612416/Nina08.pdf

Language: English

Reference Type: Journal Article

Record Number: 366

Author: M. Huxham, E. N. Kimani and J. Augley

Year: 2004

Title: Mangrove fish: A comparison of community structure between forested and cleared

habitats

Journal: Estuary Coastal and Shelf Science

Volume: 60

Pages: 637-647

Type of Article: Journal Article

Short Title: Est. Coast. and Shelf Sci.

Legal Note: Kenya

Keywords: mangrove

fish

nursery

clearing

stake net

East Africa

Abstract: The fish communities of mangrove and cleared sites were investigated in Gazi Bay, Kenya. Five forested sites were compared with paired sites that had been cleared of mangroves by human activity. Forested sites included plantations and natural stands of *Sonneratia alba* and natural *Rhizophora mucronata* stands. Two methods of stake netting were used to take quantitative samples; method one used a single 100-m-long, 18-mm mesh net, method two used paired 24-m-long, 1-mm mesh nets—samples were taken during seven different months in 2002. Mean abundances of fish found in mangrove and cleared sites, respectively, were 0.004 m⁻² and 0.014 m⁻² (method 1) and 0.21 m⁻² and 0.25 m⁻² (method 2). Thirty species were sampled, 12 of which were found exclusively in mangrove habitats and 10 of which were limited to cleared sites. The most abundant species in mangrove plots was *Atherina afra* (although it was only found in two, large catches); the most abundant in cleared plots was *Gerres oyena* (found frequently). Mean abundance (using data pooled for all sites) was significantly higher in cleared, compared with forested, sites, and multivariate analysis showed significantly different community structures in the two habitat types. There was large variation in catch rates between dates and sites, with one forested site recording no catches at all. These results do not support the predator refuge hypothesis (which predicts higher abundance of juvenile fish inside mangroves). The low abundance of fish recorded in the mangrove sites may have been due to site-specific factors determining fish abundance within mangrove forests, to the sampling techniques used or to relatively high turbidities at these sites.

Notes: 6366

'File' Attachments: <internal-pdf://Kimani3-3386484480/Kimani3.pdf>

Language: English

Reference Type: Journal Article

Record Number: 367

Author: B. Kaunda-Arara, J. M. Mwaluma, G. A. Locham, V. Øresland and M. K. Osore

Year: 2009

Title: Temporal variability in fish larval supply to Malindi Marine Park, coastal Kenya

Journal: Aquatic Conservation: Marine and Freshwater Ecosystems

Volume: 19

Issue: S1

Pages: S10-S18

Epub Date: 8 may 2009

Date: 2009

Type of Article: Journal Article

Short Title: Temporal variability in fish larval supply to Malindi Marine Park, coastal Kenya

DOI: DOI: 10.1002/aqc.1038

Legal Note: Kenya

Keywords: fish larvae

light-traps

seasonality

environmental variables

Kenya, Malindi park

Abstract: 1. Larval supply to reef sites influences adult population structure, reef connectivity and conservation potential of marine reserves, but few studies have examined this topic in the Western Indian Ocean (WIO). 2. Fish larval supply to Malindi Marine Park in Kenya was studied using light-traps for a period extending from March 2005 to June 2006. The traps caught pre-settlement fish larvae at two sites spread across the park. Catch rates (number trap₋₁ night₋₁) were used to represent larval abundance and to test the influence of seasonality and habitat characteristics on larval abundance in the park. 3. Thirty-three species of reef fish larvae in 15 families were sampled. Larval supply to the park was more diverse during the north-east monsoon season (30 species) than in the south-east monsoon season (15 species), with inter-annual variability in abundance. Higher catch rates of larvae occurred in the north-east monsoon month of March in both 2005 and 2006 and the inter-monsoon month of September 2005. 4. Family-specific temporal variation in larval abundance showed dominance of the families Apogonidae and Caesionidae in the park, with higher abundance during the north-east monsoon months. A few families (e.g. Canthigasteridae) showed dominance during the south-east monsoon season. Regression and rank Spearman correlation analyses indicated positive correlation of chlorophyll-a with larval supply while water depth had significant negative correlation with abundance of the Apogonidae and Caesionidae. 5. On a short-term temporal scale larval abundance in the park was highly correlated with the new moon lunar phase more than the full moon. However, on a long-term scale (16 months) larval supply to the park was significant only over a 2-month period and was correlated with environmental productivity more than ambient temperature. These results are useful in understanding the role of larval supply in structuring adult fish populations and the factors that force larval flux at reef sites.

Notes: 6367

'File' Attachments: <internal-pdf://Kaunda-Arara09-2722126080/Kaunda-Arara09.pdf>

Author Address: Department of Fisheries and Aquatic Sciences, Moi University, Kenya

Language: English

Reference Type: Thesis

Record Number: 368

Author: G. K. Mwatha

Year: 1997

Title: Aspects of the reproductive biology and fishery of the blue marbled parrot fish *Leptoscarus vaigiensis* (Quoy and Gaimardi, 1824) in Kenya shallow inshore waters

City: Nairobi

University: University of Nairobi

Thesis Type: Thesis

Short Title: Aspects of the reproductive biology and fishery of the blue marbled parrot fish *Leptoscarus vaigiensis* (Quoy and Gaimardi, 1824) in Kenya shallow inshore waters

Abstract: The reproductive biology, growth parameters, mortalities and exploitation rate of *Leptoscarus vaigiensis* were investigated in a shallow inshore lagoon in the south coast of Kenya. The overall male to female sex ratio was 1:1.4. Statistical analysis by Chi-square showed that there is no significant difference from the 1:1 ratio ($p > 0.05$). The monthly male to female sex ratio did not show any consistent trend that could have been related to the reproductive cycle. Oocyte size-frequency distribution coupled with histological analysis of the ovary indicated unimodal distribution of oocytes in stages 1,2,3 and 6. A bimodal distribution of oocytes is evident in ovaries at maturity stages 4 and 5. The bimodal distribution included one mode of mature oocytes and the other mode made of immature oocytes. These modes were not completely separated from the immature stock, and some intermediate oocytes were evident between the two modes. However, these oocytes contained cytoplasmic vacuoles meaning that such oocyte will mature and will be spawned together with the large sized ones. There is no progression of the mature oocytes in ovaries in stage 6 of sexual maturity. At this stage, the ovaries contained only immature stock of oocytes, with few degenerating oocytes. It was inferred that an individual fish probably spawns only once during the year of study. However, the GSI and Kn calculated for the fish population, showed that there were two peak spawning times during the year of study, one between March and June with a peak in April, and the other between November and December. These months fall within the two intermonsoon periods that are experienced in the East African region. There is therefore a possibility that there are two breeding populations of *L. vaigiensis* at the area of study with each having peak spawning at a specific intermonsoon period. In the present study, the potential fecundity of *L. vaigiensis* ranged between 186,000 to 1,806,000 eggs. A mean potential fecundity of 674,000 eggs per female was determined. Fecundity was significantly related to body weight and body length. The length-weight relationships calculated for males and females were not significantly different (ANCOVA: $F=14.9$; $p=0.68$) and a single regression was calculated which adequately described the length-weight relationship of this species. The relationship obtained was $\text{Log}_{10} W = 2.86 \text{ Log}_{10} L - 1.595$. Growth and mortalities were determined from length frequency data. The growth constants were estimated from Pauly's empirical formula (Pauly 1980) which was found to be 2.30. Total (Z) and fishing mortality (F) were estimated to be 0.33 is below the optimum exploitation rate of 0.5. This could be an indication that the stock is not optimally exploited, though growth overfishing was deduced to be taking place since the recruitment into the fishery occurs when the fish is only 11.7 cm (total length) and the fish seems to mature at 16.8 cm (total length).

Notes: 6368

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 369

Author: V. Lucas, A. Wardi, K. Doorunamand, H. Z. Raboanarijadna, P. Bach, R. Pianet, D. Sigana, H. Matola, B. P. De Sousa and J. Groeneveld

Year: 2009

Title: Regional data GAP-Analysis for Component 4 (Pelagic Fishes) for SWIOFP

City: Victoria

Institution: Seychelles Fishing Authority

Document Number: Proceedings of the Regional Workshop for Component 4 of SWIOFP

Date: 10th – 12th August 2009,

Short Title: Regional data GAP-Analysis for Component 4 (Pelagic Fishes) for SWIOFP

Abstract: Gives a gap analysis for pelagic fish and structure for data collection for selected species in the SWIOFP.

Notes: 6369

'File' Attachments: internal-pdf://Gap Analysis Pelagic-4107079428/Gap Analysis Pelagic.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 370

Author: B. Kaunda-Arara, T. K. Mkare and J. K. Ombuki

Year: 2009

Title: Data Summary and Gap-analysis for Component 3 (Demersal Fisheries) Kenya-SWIOFP

City: Mombasa

Institution: KMFRI

Short Title: Data Summary and Gap-analysis for Component 3 (Demersal Fisheries)

Kenya-SWIOFP

Abstract: Gives data-summary and gap-analysis of the Kenya responsibilities towards the SWIOFP project. It selects a group of species considered as important (or potentially important) to fisheries along the Kenyan coast, identifies the gaps in existing information, and suggests a list of projects that would be of value to Kenya within a regional context in Component 3 of SWIOFP.

Notes: 6370

'File' Attachments:

internal-pdf://Kaunda-Arara_et_al[1]-3137684736/Kaunda-Arara_et_al[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 371

Author: KMFRI

Year: 2002

Title: Western Indian Ocean Preliminary Transboundary Diagnostic Analysis For Land-Based

Activities

City: Mombasa

Institution: KMFRI

Publisher: KMFRI

Short Title: Western Indian Ocean Preliminary Transboundary Diagnostic Analysis For Land-Based Activities

Notes: 6371

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 372

Author: F. Department

Year: 2008

Title: Marine waters fishery frame survey 2008

Institution: Fisheries Department

Publisher: F. D. Ministry of Fisheries Development

Type: Frame Survey 2008 Report

Short Title: Marine waters fishery frame survey 2008

Keywords: Fish landing sites, fishers, gears, crafts

Abstract: The third bi-annual frame survey conducted from 13th-15th October 2008 and was fully funded by the Ministry of Fisheries Development. Gives the current status on the number of fishers, landing sites, gears and crafts.

Notes: 6372

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 373

Author: S. T. Fennessy, G. K. Mwatha and W. Thiele

Year: 2004

Title: Report of the REGIONAL WORKSHOP ON APPROACHES TO REDUCING SHRIMP TRAWL BYCATCH IN THE WESTERN INDIAN OCEAN Mombasa, Kenya, 13-15 April 2003

Institution: FAO

Publisher: FAO

Type: FAO Report;

Short Title: Report of the REGIONAL WORKSHOP ON APPROACHES TO REDUCING SHRIMP TRAWL BYCATCH IN THE WESTERN INDIAN OCEAN Mombasa, Kenya, 13-15 April 2003

Keywords: Bycatch, shrimp trawl, small scale fishery, Western Indian Ocean

Abstract: The workshop was jointly organized by the FAO Fishery Industries Division, the Marine and Fisheries Research Institute (KMFRI) in Mombasa (Kenya) and the Oceanographic Research Institute (ORI) in Durban (South Africa), and was hosted by KMFRI.

Twenty-nine participants from five countries (Kenya, Madagascar, Mozambique, Nigeria and South Africa) attended the workshop. The participants presented national fisheries

administrations, non-governmental organizations and scientific institutions.

During the workshop, the participants discussed existing bycatch policy and legislation, the state of bycatch knowledge and impacts of bycatch, as well as methods for reducing bycatch or improving bycatch utilization in their respective countries.

The participants recommended the use of bycatch reduction devices (BRDs) in the region, to harmonize the data collection between the countries and the improved utilization of bycatch.

Notes: 6373

URL: <ftp://ftp.fao.org/docrep/fao/007/y5362e/y5362e00.pdf>

'File' Attachments: <internal-pdf://FAO734-3593903873/FAO734.pdf>

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 374

Author: E. S. A. I. a. S. Myklevoll

Year: 1984

Title: THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA

Series Editor: E. S. A. I. a. S. Myklevoll

City: Mombasa

Institution: FAO

Publisher: Bergen

Date: 13–15 March 1984

Type: FAO Report

Short Title: THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA

Keywords: Surveys

Abstract: Gives a brief on the different surveys done in the North Bank and in Kenya, giving the biomass and potential production estimates and the type of fisheries resources found.

Notes: 6374

'File' Attachments: <internal-pdf://THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA-0134981376/THE PROCEEDINGS OF THE NORAD-KENYA SEMINAR TO REVIEW THE MARINE FISH STOCKS AND FISHERIES IN KENYA.mht>

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 375

Author: K. R. Bock

Year: 1975

Title: Preliminary checklist of the fishes of the South Bank, Kilifi Creek, Kenya

Journal: Journal of the East Africa Natural History Society and National Museum

Issue: 148

Pages: 1-6

Short Title: Preliminary checklist of the fishes of the South Bank, Kilifi Creek, Kenya

Legal Note: Kenya

Keywords: Fish species

Kilifi Creek

habitats

Abstract: The area surveyed lies at the eastern (Indian Ocean) end of Kilifi Creek; only species occurring on the southern bank were recorded. Observations were made between the Mnarani Club jetty and Ras Kitoka and were confined to the area between high water mark and a depth of approximately 3 metres down the steeply sloping shelf which marks the edge of the Kilifi Creek channel (30 metres depth). The width of the strip varies from 2 to 10 metres. There were 121 species observed.

Notes: 6375

'File' Attachments: [internal-pdf://Bock148\[1\]-0192001536/Bock148\[1\].pdf](internal-pdf://Bock148[1]-0192001536/Bock148[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 376

Author: K. R. Bock

Year: 1972

Title: Preliminary checklist of lagoonal fishes of Diani, Kenya

Journal: Journal of the East Africa Natural History Society and National Museum

Volume: 137

Short Title: Preliminary checklist of lagoonal fishes of Diani, Kenya

Legal Note: Kenya

Abstract: Gives the checklist of fishes found in south coast of Kenya, Diani.

Notes: 6376

'File' Attachments: [internal-pdf://Bock137\[1\]-0772720640/Bock137\[1\].pdf](internal-pdf://Bock137[1]-0772720640/Bock137[1].pdf)

Language: English

Reference Type: Report

Record Number: 378

Author: S. Katua

Year: 2009

Title: Environment for development-Country profile: Kenya

Series Title: Nairobi Convention Focal Point

Institution: UNEP

Short Title: Environment for development-Country profile: Kenya

Abstract: The Kenyan coastline, extending from the border with Somali in the north to Tanzania in the south is about 600 km long and is endowed with rich natural resources which support the local as well as the national economy. These include terrestrial forests, mangrove forests, fisheries, coral reefs, sandy beaches and seagrass beds.

Notes: 6378

URL:

http://www.unep.org/NairobiConvention/The_Convention/Contracting_Parties/Contracting_Parties_Kenya.asp

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 379

Author: R. E. Okoola

Year: 1999

Title: A diagnostic study of the Eastern Africa monsoon circulation during the Northern Hemisphere spring season

Journal: International Journal of Climatology

Volume: 19

Pages: 143–168.

Type of Article: Research Article

Short Title: A diagnostic study of the Eastern Africa monsoon circulation during the Northern Hemisphere spring season

Original Publication: International Journal of Climatology

Legal Note: Kenya

Abstract: The eastern Africa monsoons during the Northern Hemisphere spring (NHS) season are described based on composites derived from various rainfall anomaly scenarios. The years 1981/1984 were delineated as some of the recent wettest/driest years over this region during the NHS season. Wet/dry spells within these anomalous years were further selected using PCA T-mode analysis. Both the anomalous years and the wet/dry spells identified from these years were used to create wind composites that were used to describe the eastern Africa Monsoon circulation. Composite wind analyses showed the dominance of the westerlies/easterlies in the lower/upper troposphere and their migration from the Southern Hemisphere to the Northern Hemisphere. Analysis of the individual wettest/driest years showed that before the start of the equatorial eastern Africa (EEA) long-rains season, easterlies are dominant near the Equator and westerlies near 15°S in the lower troposphere, while at the end of the rainy season the westerlies were located to the north of the Equator, near 5°N, with easterlies on their lateral sides. However, during the EEA long-rains season westerly/easterly wind events occurred in alternation over the region. These westerly/easterly episodes were associated with wet/dry rainfall spells. Vertical sections of zonal wind component showed that the wind alignment during wet spells was similar to that generally observed in other monsoonal regions, with lower tropospheric westerlies overlain by upper tropospheric easterlies. But the reduced frequency of lower tropospheric westerlies is suggested to be due to the barrier effect of the north-south mountain chains which allow only the most intense westerlies to cross the mountains into the EEA region. Copyright © 1999 Royal Meteorological Society

Notes: 6379

'File' Attachments: [internal-pdf://Okoola\[1\]-3179516416/Okoola\[1\].pdf](internal-pdf://Okoola[1]-3179516416/Okoola[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 380

Author: A. L. Baquero-Bernal, Mojib; Legutke, Stefanie

Year: 2002

Title: On Dipolelike Variability of Sea Surface Temperature in the Tropical Indian Ocean

Journal: Journal of Climate

Volume: 15

Issue: 11

Pages: 1358-1368

Date: 2002

Type of Article: Research Article

Short Title: On Dipolelike Variability of Sea Surface Temperature in the Tropical Indian Ocean

Original Publication: Journal of Climate

Legal Note: Kenya

Abstract: The interannual variability of the tropical Indian Ocean sea surface temperature (SST) is studied with observational data and a hierarchy of coupled general circulation models (CGCMs). Special attention is given to the question of whether an oscillatory dipole mode exists in the tropical Indian Ocean region with centers east and west of 80°E. These results indicate that dipolelike variability can be explained as an oscillatory mode only in the context of El Niño–Southern Oscillation (ENSO). A dipolelike structure in the SST anomalies independent of ENSO was found also. This series of coupled model experiments shows that ocean dynamics is not necessary to this type of dipolelike SST variability. It is forced by surface heat flux anomalies that are integrated by the thermal inertia of the oceanic mixed layer, which reddens the SST spectrum.

Notes: 6380

'File' Attachments:

internal-pdf://1520-0442%25282002%2529015%253C1358%253Aodvoss%253E2%252E0%252Eco%253B2[1]-3456868352/1520-0442%25282002%2529015%253C1358%253Aodvoss%253E2%252E0%252Eco%253B2[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 381

Author: R. A. M. a. P. R. J. M. Society

Year: 1983

Title: Observation of the 40-50-Day tropical Oscillation-A Review

Type of Article: Research Article

Short Title: Observation of the 40-50-Day tropical Oscillation-A Review

Original Publication: Journal of Physical Oceanography

Legal Note: Kenya

Abstract: Observational aspects of the 40-50 day oscillation are reviewed. The oscillation is the result of large-scale circulation cells oriented in the equatorial planet that move eastward from at least the Indian Ocean to the central Pacific. Anomalies in zonal winds and the velocity potential in the upper troposphere often propagate the full circumference of the globe. Related, complex convective regions also show eastward movement. There is a zonally symmetric

component to the oscillation. It is manifest in changes in surface pressure and in the relative atmospheric angular momentum. The oscillation is an important factor in the timing of active and break phases of the Indian and Australian monsoons. It affects ocean waves, currents and air-sea interactions.

Notes: 6381

Language: English

Reference Type: Journal Article

Record Number: 382

Author: P. Camberlin and J. G. Waioto

Year: 1997

Title: Intraseasonal wind anomalies related to wet and dry spells during the “long” and “short” rainy seasons in Kenya

Journal: Theoretical and Applied Climatology

Volume: 58

Issue: 1-2

Pages: 57-69

Type of Article: Research Article

Short Title: Intraseasonal wind anomalies related to wet and dry spells during the “long” and “short” rainy seasons in Kenya

Original Publication: Journal of Theoretical and Applied Climatology

Legal Note: Kenya

Abstract: Summary The largest part of Kenya exhibits two major rainy seasons, the March–May «long rains» and the October–December «short rains», both related to the passage of the ITCZ, but differing in the amount of rainfall recorded and its interannual variability. In order to investigate whether these differences also apply at intraseasonal time-scales, daily rainfall data for the peak month of each rainy season (April and November) were collected for 7 consecutive years (1982–1988). The network comprises 68 stations, from which a classification of the spatial patterns of daily rainfall anomalies has been performed. Wind anomalies corresponding to the various rainfall types and to specific regional rainfall departures were determined using four pilot balloon stations and one radiosonde station. They revealed that there exist significant differences between upper-air circulation anomalies exhibited in the «long» and «short» rainy seasons, especially as far as rain spells in the Eastern Highlands are concerned. In that region, easterly anomalies in the «short rains» period are associated with an increase in rainfall. During the «long rains», enhanced easterlies more generally coincide with an overall drop of convection in the country. In Western Kenya, wet conditions are more systematically associated to westerly wind anomalies.

Notes: 6382

'File' Attachments: internal-pdf://Camberlin[1]-1475153408/Camberlin[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 383

Author: C. C. Mutai and M. N. Ward

Year: 2000

Title: East African rainfall and the tropical circulation/convection on intraseasonal to interannual timescales

Journal: Journal of Climate

Volume: 13

Pages: 3915-3939

Type of Article: Research Article

Short Title: East African rainfall and the tropical circulation/convection on intraseasonal to interannual timescales

Legal Note: Kenya

Keywords: Rain ; Atmospheric circulation ; El Nino ; Southern oscillation ; Sea surface ; Surface temperature ; Eigenvector ; Empirical orthogonal function ; Teleconnection ; Anomaly ; Annual variation ; Madden Julian oscillation ; Convection flow ; Ocean atmosphere interaction ; East Africa ; Africa ;

Abstract: It is known that the East African short rains (October-December, OND) have a positive correlation with El Niño-Southern Oscillation (ENSO). A prediction scheme based on sea surface temperature eigenvectors (SST EOFs) including Pacific, Indian, and Atlantic Ocean variability showed skill higher than one based on ENSO alone. First the authors assess the extent to which the large-scale SST predictors correlate with rainfall averaged over smaller subregions of East Africa. Most regions correlate consistently well, though some pockets of lower correlations suggest that interaction with orographic features may modulate the large-scale ENSO and other coupled ocean-atmosphere signals in the region. Next, to evaluate the atmospheric teleconnections giving rise to the SST correlations, the circulation anomalies associated with East African rainfall are investigated using National Centers for Environmental Prediction-National Center for Atmospheric Research reanalysis data and, as a proxy for large-scale tropical convection anomalies, outgoing longwave radiation (OLR). In the seasonal OND mean, a sequence of three horseshoe structures are evident in the OLR anomalies, with anomaly sign in phase over the central Pacific and East Africa, and out of phase over the Maritime Continent. This gives rise to the positive ENSO association with East African rainfall. The horseshoe structures in the Indian Ocean are absent in September and through much of the long rains in March-May, though weakly evident again in May. It is suggested that the presence or absence of this teleconnection structure is related to the state of the background annual cycle. When the ENSO variance is removed (by linear regression) from the datasets, there emerges more strongly a positive correlation between East African rainfall in OND and enhanced convection through equatorial Africa and into the equatorial Atlantic and Amazon region, in turn associated with warm equatorial and tropical South Atlantic SST. The lead-lag structure of intraseasonal teleconnections with East African rainfall suggests that 5-10 days before the rainfall event, low-level dynamics start to develop in the equatorial Atlantic, and these penetrate across equatorial Africa and into East Africa during the event itself, at which time anomalies in the Pacific Ocean, which were strong 15 days before the event, are now weaker. Five days after the rainfall event, 200-hPa divergence over East Africa pulls off the east into the Indian Ocean and shows structures that resemble the Madden-Julian oscillation. For above-normal rainfall in East Africa, the seasonal mean teleconnection across the Indian Ocean resembles this intraseasonal picture with strong convection particularly just off the East African

coast, prompting discussion of the interaction between the intraseasonal and seasonal anomalies

Notes: 6383

'File' Attachments: internal-pdf://mutai_oceans-0421453312/mutai_oceans.ppt

Language: English

Reference Type: Journal Article

Record Number: 384

Author: T. D. Davies , C. E. Vincent and A. K. C. Beresford

Year: 1985

Title: July-August rainfall in West-Central Kenya

Journal: International Journal of Climatology

Volume: 5

Issue: 1

Pages: 17-33

Start Page: Royal Meteorological Society

Type of Article: Research Article

Short Title: July-August rainfall in West-Central Kenya

Original Publication: International Journal of Climatology

Legal Note: Kenya

Keywords: Kenya rainfall • July-August • Kenya rainfall • Rainfall seasonally in Kenya • Rainfall-topography relationships in Kenya

Abstract: The annual rainfall distribution in west-central Kenya (34°-38°E, 1°N-1°S) exhibits marked spatial variation because of the complicated nature of the local topography. The annual distributions are classified into a number of types on the basis of rainfall seasons. Over parts of the area of study, precipitation falling in July and August makes an important contribution to the yearly total (up to 33 per cent). The spatial variation of the rainfall in this period, during the so-called dry season over much of Kenya (between the two main monsoon rains) is examined in some detail, especially its relationship with altitude. The distribution of the July and August rainfall indicates that it is associated with a westerly airstream overlying the lowest layers of the atmosphere.

Notes: 6384

Author Address: School of Environmental Sciences, University of East Anglia, Norwich, NR4 7TJ, U.K.

Language: English

Reference Type: Report

Record Number: 385

Author: K. M. D. Ministry of special programmes, NEMA, KMFRI and M. o. S. Programs

Year: 2006

Title: The National Environmental Emergency Contingency Plan

Short Title: The National Environmental Emergency Contingency Plan

Abstract: Kenya has had no specific and organized preparedness and response plan to mitigate and manage the effects of environmental emergencies that can be caused by natural and

manmade hazards. While natural disasters on the environment include occurrences of earthquakes, flooding, droughts, famine and wild fires, manmade ones include acts of terrorism, wars and technological hazards. These disasters can have harmful consequences on the national environment that can, in turn, endanger the security, health and safety of people. Hitherto the country's approach to the past environmental disasters has been reactive rather than pro-active. The purpose of this report is to create a pro-active preparedness and response mechanism to future environmental disasters. This report proposes the establishment of specific and standing National environmental Emergency Contingency Plan to mitigate the negative effects of the above mentioned disasters on the environment. It has provided for a co-ordinated and integrated national procedures and responses specifically focused on dealing with environmental emergencies wherever they occur in the country. The proposed Plan is to be established and organized at all government administration levels of the country (see proposed org. chart on page -). The Plan has developed a wholesome approach to environmental conservation, preservation, preparedness, monitoring, early warning, response, recovery and post recovery following the occurrence of any environmental emergency. The Kenya National Environmental Emergency Contingency Plan (KNEECP) is organized to improve disaster response mechanisms from the individual people when disasters strike at village, locational, divisional, district, provincial and national levels and beyond. The Plan will exist as part of the overall National Disaster Co-ordination Committee (NDCC) currently managed and operated under the Office of the President, Special Programmes. The KNEECP provides a national Platform from which national resources will be mobilized to assist and support other contingency plans or response efforts. To operationalise the proposed Plan, lead agencies operating under the Office of the President, Special Programmes will spearhead the National Environmental Council (NEC) at national level and will comprise the government Ministers and Permanent Secretaries of the following Ministries: Environment and National Resources, Water and Irrigation, Land and Housing, Agriculture, Health, Livestock and Fisheries, Information and Communications, Tourism and Wildlife and Finance. Other government ministries will be co-opted by the NEC as situations may dictate from time to time. The NEC organizational structure at national level is replicated at all the other government administration levels representing all the above lead Ministries at the village, locational, divisional, district and provincial levels. The proposed plan is supplementary or complimentary to any other existing plans dealing with other national disasters. It focuses on co-ordinating available experts and response resources required to deal with environmental emergencies caused by disasters. It provides for early warning, monitoring and response. Its operations may be superseded by any plan or authorized procedures that address matters specific to state security. All environmental disaster operating levels of NEC will work and closely collaborate with the National Environmental Authority (NEMA) representatives in those levels to ensure that all actions undertaken to restore the environment after disasters comply with environmental laws of Kenya. NEMA will act in advisory capacity both to NEC and the NDCC as shown in the KNEEP organogram.

Notes: 6385

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 386

Author: S. E. Nicholson and J. Kim

Year: 1997

Title: The Relationship of the El Niño–Southern Oscillation to African Rainfall

Journal: International Journal of Climatology

Volume: 17

Pages: 117-135

Date: 1997

Type of Article: Research Article

Short Title: The Relationship of the El Niño–Southern Oscillation to African Rainfall

Legal Note: Kenya

Keywords: Africa; rainfall; ENSO; harmonic analysis

Abstract: This is a comprehensive study of the rainfall response over Africa to ENSO episodes in the Pacific. The harmonic method utilized by Ropelewski and Halpert is applied to 90 regionally averaged rainfall time series for the period 1901–1990. The analysis was a composite of 20 episodes within this period. Seasons of maximum positive anomalies and maximum negative anomalies in the composite were identified. The method identifies 15 multiregion sectors where ENSO appears to modulate rainfall. The strongest signals are in eastern equatorial and south-eastern Africa. A continental-scale signal is also apparent. The magnitude, seasonal timing and duration, and consistency of the rainfall response to ENSO vary among the sectors and from episode to episode. The rainfall response is clearly seasonally specific. In general, the onset of the ENSO signal in rainfall commences far to the south and propagates latitudinally northward. For this reason, the equatorial regions are out-of-phase with the continental pattern. The ENSO mechanism is probably responsible for many of the well-established rainfall teleconnections over the continent, including the strong tendency for opposite anomalies in equatorial and southern Africa. There is a strong tendency for positive anomalies to occur during the first half of the ENSO cycle, negative during the second half. This corresponds to 'cold' and 'warm' phases in the adjacent Atlantic and Indian Oceans; continentally, rainfall tends to be enhanced during the cold phase, reduced during the warm phase. The northward propagation is most pronounced during the cold phase; a similar propagation and phase shift occurs at this time in the Atlantic. The rainfall anomalies of the warm phase are nearly constant in phase, as are the SST anomalies in the Indian Ocean. This suggests that, in general, the Atlantic Ocean controls rainfall during the cold phase, the Indian Ocean during the warm phase

Notes: 6386

'File' Attachments: [internal-pdf://elnino\[1\]-0168720384/elnino\[1\].pdf](internal-pdf://elnino[1]-0168720384/elnino[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 387

Author: H. Spencer, R. T. Sutton, J. M. Slingo, M. Roberts and E. Black

Year: 2005

Title: Indian Ocean Climate and Dipole Variability in Hadley Centre Coupled GCMs

Journal: Journal of Climate

Volume: 18

Pages: 2286-2307

Type of Article: Research Article

Short Title: Indian Ocean Climate and Dipole Variability in Hadley Centre Coupled GCMs

Original Publication: American Meteorological Society

Legal Note: Kenya

Abstract: Prediction of Indian Ocean interannual variability may be limited by the systematic biases in coupled GCMs or by a lack of resolution of the processes involved. In particular, little is known about the impact of ocean resolution on simulated climate variability. The simulation of Indian Ocean climate and dipole is investigated in Hadley Centre coupled models with different horizontal and vertical ocean resolutions.

The mean state of the Indian Ocean is found to improve only slightly when horizontal resolution is increased from 1.25° to 1/3° and when vertical resolution is increased from 20 to 40 vertical levels due to a small reduction of the Maritime Continent warm bias. However, improvements in the simulation of the

dipole are more substantial. All versions of the model realistically simulate dipole onset between April and June, peak in September to October, and then rapidly decay between October and January. The SST anomalies are accompanied by realistic equatorial easterly wind anomalies with thermocline shoaling in the east and deepening in the southwest.

In the model with the 1.25° ocean and 20 vertical levels, the dipoles do not terminate completely but persist through the austral summer and then frequently reinvigorate the following year. This unrealistic behavior is eliminated when the ocean vertical resolution is increased from around 20 m in the thermocline to 10 m in the whole of the top 135 m and when Java is represented (even at 1.25° resolution). It is hypothesized that the improvement is due to the resolution of the separation between the thermocline and the surface and also due to the small reduction of the Maritime Continent warm bias.

Notes: 6387

'File' Attachments: [internal-pdf://BLACK2005\[1\]-0673187584/BLACK2005\[1\].pdf](internal-pdf://BLACK2005[1]-0673187584/BLACK2005[1].pdf)

Language: English

Reference Type: Journal Article

Record Number: 388

Author: L. S. Yu and M. Rienecker

Year: 1999

Title: Mechanisms for the Indian Ocean warming during the 1997–98 El Niño

Journal: Geophysical Research Letters

Volume: 26

Issue: 6

Pages: 735-738

Type of Article: Journal Article

Short Title: Mechanisms for the Indian Ocean warming during the 1997–98 El Niño

Legal Note: Kenya

Abstract: Study examines primary mechanisms that gave rise to the basin-wide variation of the sea surface temperatures in the Indian Ocean during the 1997-98 El Niño by using multi-source

data sets. During June-December 1997 when the el Nino in the pacific was maturing, the Indian Ocean experienced the reversal of the Walker Circulation and the prolonged equator ward displacement of the southeast trades. Consequently the easterly winds associated with the reversed walker circulation produced Kelvin/rossby waves causing upwelling and downwelling of the equatorial ocean affecting the equatorial hat balance causing the reversal of the zonal SST gradient in the fall of 1997. The negative SST anomalies I the east and positive in the west helped maintain and prolong the equatorial easterlies. Changes of latent heat flux induced by wind speed variations played a major role in the broad scale warming. The effect was most significant in the summer/fall of 1997 when the trades winds weakened considerably, leading to dramatic reduction of latent heat release and subsequently a rapid surface warming in the southern ocean.

Notes: 6388

'File' Attachments: internal-pdf://Yu[1]-3506693888/Yu[1].pdf

Author Address: JCESS/Department of Meteorology, University of Maryland, College Park, Maryland

Language: English

Reference Type: Report

Record Number: 389

Author: R. A. Houghton

Year: 2007

Title: Balancing the Global Carbon Budget

Institution: TheWoods Hole Research Center, Falmouth, Massachusetts 02540;

Publisher: A. R. o. E. a. P. Sciences

Short Title: Balancing the Global Carbon Budget

Keywords: carbon sinks, climate feedbacks, CO₂, fossil fuels, oceans, terrestrial ecosystems

Abstract: The global carbon budget is, of course, balanced. The conservation of carbon and the first law of thermodynamics are intact. "Balancing the carbon budget" refers to the state of the science in evaluating the terms of the global carbon equation. The annual increases in the amount of carbon in the atmosphere, oceans, and land should balance the emissions of carbon from fossil fuels and deforestation. Balancing the carbon budget is not the real issue, however. The real issue is understanding the processes responsible for net sources and sinks of carbon. Such understanding should lead to more accurate predictions of future concentrations of CO₂ and more accurate predictions of the rate and extent of climatic change. The recent past may be insufficient for prediction, however. Oceanic and terrestrial sinks that have lessened the rate of growth in atmospheric CO₂ until now may diminish as feedbacks between the carbon cycle and climate become more prominent.

Notes: 6389

URL: Balancing the carbon budget HoughtonAnnRevEarthPlanet.07.pdf

'File' Attachments: internal-pdf://Balancing the carbon budget

HoughtonAnnRevEarthPlanet.07-2394283264/Balancing the carbon budget

HoughtonAnnRevEarthPlanet.07.pdf

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Report

Record Number: 390

Author: K. E. Trenberth and P. D. Jones

Year: 2007

Title: Observations: Surface and Atmospheric Climate Change

Publisher: IPCCAR4

Type: Report

Short Title: Observations: Surface and Atmospheric Climate Change

Abstract: Global mean surface temperatures have risen by $0.74^{\circ}\text{C} \pm 0.18^{\circ}\text{C}$ when estimated by a linear trend over the last 100 years (1906–2005). The rate of warming over the last 50 years is almost double that over the last 100 years ($0.13^{\circ}\text{C} \pm 0.03^{\circ}\text{C}$ vs. $0.07^{\circ}\text{C} \pm 0.02^{\circ}\text{C}$ per decade). Global mean temperatures averaged over land and ocean surfaces, from three different estimates, each of which has been independently adjusted for various homogeneity issues, are consistent within uncertainty estimates over the period 1901 to 2005 and show similar rates of increase in recent decades. The trend is not linear, and the warming from the first 50 years of instrumental record (1850–1899) to the last 5 years (2001–2005) is $0.76^{\circ}\text{C} \pm 0.19^{\circ}\text{C}$.

Notes: 6390

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Report

Record Number: 391

Author: K. M. Department

Year: 2009

Title: Coping with climate variability and change in Kenya

Institution: Kenya Meteorological Department Report to WMO-2009

Publisher: K. M. Department

Type: Report

Short Title: Coping with climate variability and change in Kenya

Abstract: Climate change can be described as a permanent shift in the normal patterns of climate. Such a shift could spread over a period of decades, or even longer. There is discernible evidence – derived from numerous climate detection processes – that climate is changing across the entire globe. For a local farmer or herdsman, however, abstract scientific notions of climate change make little sense. A definition relating to livelihood – detailing associated impacts that people can relate to – is essential if we are ever to deal with the problems climate change brings. As such, climate change can be defined as lack of rain or changes to rainfall patterns. Practical conclusions can be drawn from such a description since it will affect agricultural factors such as: planting times; withering of crops; drying of streams and rivers; dying of livestock; and hotter nights. The significance of climate should not be underestimated. It provides for all the basic needs of living organisms including food, water and air. Furthermore, it renders the earth beautiful by providing flowers, plants, deserts, oceans, rivers and animals. Over many millennia, human beings and the earth's ecosystems have adapted to climate conditions. As such, climate change will necessitate alterations in ecosystems, as well as in

human lifestyles through appropriate adaptation strategies.

Notes: 6391

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Thesis

Record Number: 393

Author: A. J. Mafimbo and C. Reason

Year: 2008

Title: Air-Sea Interactions over the upwelling region of the Somali coast

University: University of Cape Town

Degree: MSc

Thesis Type: MSc Thesis

Short Title: Air-Sea Interactions over the upwelling region of the Somali coast

Abstract: During the southwest monsoon, two upwelling cells are established along the Somali coast, around 4-5⁰N and 10⁰N respectively. The sea surface temperatures (SSTs) over these regions can fall to about 22⁰C on average during this time. Using satellite derived data, the co-variability in wind and SST are examined for the months June-August 2005, a particularly strong upwelling season. In July 2005, when a strong localized upwelling event occurred near 4-5⁰N, the Somali jet, which establishes itself along the coast during June-August, was found to have oscillated at a frequency of about 4-8 weeks. High co-variability in mesoscale winds and SSTs were found over the upwelling region. The observed co-variability of wind and SSTs is argued to be the result of SST modulation of the atmospheric stability such that over warm temperatures, the unstable atmosphere brings down high winds, and over cold temperatures, the stable atmosphere decelerates the surface winds. These SST induced changes in the lower atmosphere lead to changes in wind stress divergence and a dipole in wind stress curl across the cold filament with negative (positive) curl up- (downstream) of the cold tongue.

Notes: 6393

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 394

Author: J. C. Swallow, R. L. Molinari, J. G. Bruce, O. Brown and R. Evans

Year: 1983

Title: Development of Near-Surface Flow Pattern and Water Mass Distribution in the Somali Basin in response to the Southwest Monsoon of 1971

Journal: Journal of Physical Oceanography

Type of Article: Journal Article

Short Title: Development of Near-Surface Flow Pattern and Water Mass Distribution in the Somali Basin in response to the Southwest Monsoon of 1971

Original Publication: American Meteorological Society

Legal Note: Kenya

Abstract: Near-Surface observations of temperature, salinity and currents are used to describe

the seasonal reversal of the Somali current during 1997, in response to the onset of the southwest monsoon winds.

Results were that during April the East African Coastal Current (EACC) and Somali Current (SC) converge near the equator. The EACC had salinities less than 35.1‰ and SC more than 35.3‰. The reversal of winds during May introduced an anticyclonic gyre around 2.50N re-circulating the low salinity water south of the equator. A second gyre spun up north of the southern feature. During July and early August the southern gyre intruded further north, the northern gyre intensified and the equatorial jet disappeared.

Notes: 6394

'File' Attachments: <internal-pdf://Swallow-1884347392/Swallow.pdf>

Language: English

Reference Type: Journal Article

Record Number: 395

Author: G. A. Vecchi, S. Xie and A. S. Fischer

Year: 2004

Title: Ocean Atmosphere Covariability in the Western Arabian Sea

Journal: Journal of Climate

Volume: 17

Pages: 1213-1224

Type of Article: Journal Article

Short Title: Ocean Atmosphere Covariability in the Western Arabian Sea

Original Publication: American Meteorological Society

Legal Note: Kenya

Abstract: The western Arabian Sea exhibits strong spatial variability in sea surface temperature (SST) during the southwest monsoon, with changes in SST that can exceed 5°C over 200 km. Exploration of satellite-based and in situ data shows a strong connection between mesoscale SST features and changes in the atmospheric boundary layer. The fundamental relationship is that of weak (strong) wind velocities overlying cold (warm) SST features. There are also coherent changes in other near-surface meteorological parameters, such as the air-sea temperature difference and relative humidity—indicating changes in the stability of the planetary boundary layer over the mesoscale SST features. These relationships are similar to those recently reported over the equatorial Pacific tropical instability wave region. This observed covariability of atmospheric boundary layer structure and SST results in variations of the surface heat and moisture fluxes; latent heat flux is modified by changes in relative humidity (principally through the temperature dependence of saturation specific humidity), wind speed, and boundary layer stability over the cold filaments. The nonlinear dependence of latent heat flux on the three parameters leads to a net enhancement of latent heat flux from the mesoscale features, as compared to that computed using spatially averaged parameters. Additionally, the spatial structure of the heat-flux variability will tend to dampen the mesoscale SST features. The mesoscale wind variability results in strong wind stress curl patterns on the same spatial scales as the oceanic features. The resulting Ekman pumping variations may play an important role in the evolution of the ocean eddy fields in this region. Further examination of the processes controlling the observed covariability, and the oceanic and atmospheric

response to the coupling should therefore be undertaken.

Notes: 6395

'File' Attachments: internal-pdf://Vecchi-1747587328/Vecchi.pdf

Language: English

Reference Type: Journal Article

Record Number: 396

Author: K. M. Department

Year: 2008

Title: Report on the Status of Implementation of Tsunami Early Warning System

Journal: Kenya Meteorological Department

Type of Article: Kenya Meteorological Department

Short Title: Report on the Status of Implementation of Tsunami Early Warning System

Legal Note: Kenya

Abstract: Tsunami waves are generated by earthquakes on the sea-bed, submarine landslides and volcanic eruptions at sea. Kenya neighbours the Indian Ocean and therefore it lies within the realm of Tsunami generated within the Indian Ocean. Although a tsunami cannot be prevented, its impact can be mitigated through community and emergency preparedness, timely warnings, effective response, and public education. Kenya has already established the National Warning Centre (Kenya Meteorological Department-KMD) and Information Centre (National Disaster Operation Centre-NDOC) as required by the Indian Ocean Tsunami Warning System (IOTWS). A number of Tide gauges have been installed at Lamu, Malindi, Kilifi and Shimoni as Tsunami early Warning Network and KMD is planning to install a DART buoy in the deep seas within its EEZ to monitor and detect Tsunami and other marine hazards. The collaborating institutions include Kenya Marine Fisheries Research Institute (KMFRI), Intergovernmental Oceanographic Commission of UNESCO (IOC/UNESCO), all maritime Organizations through the Kenya National Hydrographic Committee.

Notes: 6396

Language: English

Reference Type: Journal Article

Record Number: 397

Author: M. K. W. Osore, F. Fiers and M. H. Daro

Year: 2003

Title: Copepod composition, abundance and diversity in Makupa Creek, Mombasa, Kenya

Journal: Western Indian Ocean Journal of Marine Science

Volume: 2

Issue: 1

Pages: 65-73

Date: 2004

Type of Article: Journal Article

Short Title: Copepod composition, abundance and diversity in Makupa Creek, Mombasa, Kenya

Legal Note: Kenya

Keywords: Mangroves, Copepods, Tidal cycle, Diel cycle.

Abstract: In order to determine the resident assemblages of zooplankton in Mida Creek, Kenya, a survey was conducted from May 1996 to Apr. 1997 for which we studied their seasonal composition, abundance, and distribution. Twenty-seven major zooplankton taxa were identified. The order Copepoda was the most abundant taxon dominated mainly by the genera *Acartia*, *Paracalanus*, *Labidocera*, *Temora*, *Centropages*, and *Calanopia*. Other common zooplankton taxa included the Medusae, Ctenophora, Brachyura larvae, and Chaetognatha. The highest abundances (1961 ± 540 to 2856 ± 788 individuals/m³) were recorded during the dry season from Feb. to Mar., while the lowest ones (77 ± 21 to 352 ± 98 individuals/m³) were seen in the wet season from May to July. Vertical migration and the tidal cycle were the main factors affecting variations in diel zooplankton abundance and diversity. However, the monthly composition of the taxa varied only minimally.

Notes: 6397

'File' Attachments: internal-pdf://Osore[1]-1780609024/Osore[1].pdf

Language: English

Reference Type: Thesis

Record Number: 398

Author: M. M. Kimaro

Year: 1986

Title: The composition, distribution and abundance in near-surface zooplankton of Tudor Creek, Mombasa.

City: Nairobi

University: University of Nairobi

Degree: Master's

Thesis Type: Master's Thesis

Short Title: The composition, distribution and abundance in near-surface zooplankton of Tudor Creek, Mombasa.

Notes: 6398

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Thesis

Record Number: 399

Author: E. N. Okemwa and R. K. Ruwa

Year: 1990

Title: A study of the pelagic copepods in a tropical marine creek, Tudor, Mombasa, Kenya with a special reference to their community structure, biomass, and productivity.

City: Brussels

University: Vrije Univ.

Degree: Ph.D

Thesis Type: Ph.D. thesis

Short Title: A study of the pelagic copepods in a tropical marine creek, Tudor, Mombasa, Kenya with a special reference to their community structure, biomass, and productivity.

Abstract: This study was undertaken with a view to: (a) describe the species composition and the community structure of copepods in the Tudor Creek; (b) describe the spatio-temporal distribution of pelagic copepods as well as estimating their abundance, and finally to estimate both primary production, biomass and respiration in Tudor Creek. The first quantitative study of the pelagic zooplankton community of the Tudor Creek, Mombasa, Kenya, was undertaken from December 1984 to December 1987. Using a Bongo plankton net of 335 μm mesh from R.V. Maumba from December to March 1985. From April 1985 to December 1987 a small canoe with an outboard engine was used. A conical plankton net having a mesh aperture size of 335 μm fitted with a flow-meter at the mouth of 45 cm diameter and a length of one meter long was used for sampling. Surface-plankton samples were taken using a small canoe at each of the five permanent stations during day-time and night-time during one neap and one spring of every month from September 1985 to August 1986. Thereafter only day-time neap and spring samples were taken from September 1986 to December 1987 in five stations. 24-hours cycle sampling was occasionally done at stations 1 and 5 simultaneously. The neap tide sampling of the 24-hour cycle started at 0900 h on 23rd September 1985 and the last samples were taken at 0900 h the following day. Sampling during the spring tide started at 0900 h on 1st October 1985 to 0900 h on 2nd October 1985. Every two hours zooplankton was collected by horizontal hauls at 1.3 m depth with a 335 μm mesh net. Simultaneously the following abiotic parameters were measured: for information on salinity, temperature, transparency, oxygen concentration and pH. Fresh zooplankton was sampled from January 1986 to February 1986, in February 1987 and from February 1988 to March 1988 every morning with a plankton net of 335 μm mesh aperture on board of the small canoe at very low speed during about 2 hour. Live sample was put in a bucket with fresh sea water and brought to the laboratory, for respiration experiments, length and weight measurements. Hydrographic parameters, including surface water salinity and temperature, turbidity, dissolved oxygen and pH were also monitored during this study. Photosynthesis of phytoplankton biomass was measured in the field, using light and dark glass bottles and using oxygen methods. Results from the study have shown that zooplankton is rich and abundant and over 51 taxa were recorded. Close to 74% of zooplankton comprised copepods of which the most important were calanoids followed by cyclopoids, poecilostomatoids, harpacticoids and monstrilloids in that order. Calanoids were the dominant group of copepods in all the samples, followed by poecilostomatoids, cyclopoids, harpacticoids and lastly Monstrilloids. The most commonly encountered calanoid species included: *Centropages orsinii*, *Acrocalanus longicornis*, *Clausocalanus farrani*, *Temora turbinata*, *Paracalanus aculeatis*, *Canthocalanus pauper*, *Undinula vulgaris*, *Acartia danae*, *Paracalanus simplex*, *Euchaeta marina*, and *Eucalanus* spp. The most common cyclopoid species encountered were *Corycaeus speciosus*, *Oncaea venusta*, *Copilia mirabilis* Dana and *Sapphirina lactens*, *Oithona plumifera*, *O.setigera*, and *O.simplex*. Three harpacticoids, *Microsetella rosea*, *Euterpina acutifrons*, and *Macrosetella gracilis* were the commonest. Only occasionally did copepods of the order Monstrilloida show up in the samples. Some 99 copepod species, representing 41 genera and 30 families, have been identified. Amongst these 17 species are dominant but 6 species including *Calanus darwini*, *Labidocera laevidentata*, *Paracalanus crassirostris*, *P.indicus*, *P.tropicus* and *Sapphirina lactens*, have been recorded in Western Indian Ocean off Kenya coast for the first time. Both diel and seasonal changes in the abundance of zooplankton catches occur. While night catch numbers are higher than day ones the seasonal

changes seen appear to be strongly associated with the dry and wet periods. Mean annual total copepod biomass was 308, 90 and 149 mg dw 10 m⁻³ for the first, second and third years of study, respectively. Peaks biomass of copepods as well as Primary production in the Tudor Creek were recorded in May-June and again in November-December which are the rain months in Kenya. Respiration rates per unit weight of copepods is higher at night than day time.

Notes: 6399

'File' Attachments: internal-pdf://Okemwa_PhD[1]-0845083909/Okemwa_PhD[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 400

Author: J. M. Mwaluma

Year: 1993

Title: Zooplankton studies in mangrove, seagrass and coral reef systems, Gazi Bay, Kenya.

Editor: e. MA Hemminga

Book Title: Second semi-annual report on the STD-3 project on inter linkages between eastern African ecosystems.

Publisher: Netherlands Institute of Ecology (CEMO)

Pages: 77-82.

Series Editor: t. Netherlands:

Short Title: Zooplankton studies in mangrove, seagrass and coral reef systems, Gazi Bay, Kenya.

Section: Kenya

Notes: 6400

Last Modified Date: Emmanuel Mbaru

Language: Emmanuel Mbaru

Reference Type: Thesis

Record Number: 401

Author: M. K. Osore

Year: 1994

Title: A study on the zooplankton of Gazi Bay, Kenya and the adjacent waters: community structure and seasonal variation.

City: Brussels

University: Vrije Universiteit

Degree: Masters

Thesis Type: Masters thesis.

Short Title: A study on the zooplankton of Gazi Bay, Kenya and the adjacent waters: community structure and seasonal variation.

Notes: 6401

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 402

Author: T. R. McClanahan

Year: 1988

Title: Seasonality in East Africa's coastal waters

Journal: Marine Ecology Progress Series

Volume: 44

Pages: 191-199

Short Title: Seasonality in East Africa's coastal waters

Legal Note: Kenya

Abstract: A review of existing literature and data on seasonal patterns in East Africa's coastal waters indicates distinct seasonality in physical, chemical and biological oceanographic parameters. Seasonal patterns are dictated by the behavior of the Inter-Tropical Convergence Zone (ITCZ) which creates 2 distinct seasons- the northeast and southeast monsoons. SE monsoon (March to October) meteorological parameters are characterized by high cloud cover, rainfall, river discharge, terrestrial runoff and wind energy while solar insolation and temperatures are low; SE monsoon oceanographic parameters are characterized by cool water, a deep thermocline, high water-column mixing and wave energy, fast currents, low salinity and high phosphorus. These parameters are reversed during the NE monsoon. Nitrogen availability and planktonic primary productivity are high along the Somali coast and estuarine and river discharge areas during the southeast monsoons due to nutrient upwelling and terrestrial runoff. In near-shore waters off Tanzania, nitrogen fixation is the major source of nitrogen and is highest during NE monsoons when the water column is stable. Coral reef benthic algal biomass and diversity is greatest during the SE monsoons. Fish catch and reproduction are highest during NE monsoons in Kenya and Tanzania. Transition periods between monsoons may also be important times in determining productivity and reproduction.

Notes: 6402

'File' Attachments: internal-pdf://Timothy[1]-0106777605/Timothy[1].pdf

Language: English

Reference Type: Journal Article

Record Number: 403

Author: M. E. Hay, R. E. Hecky and Kilham

Year: 1984

Title: Predictable spatial escapes from herbivory: how do these affect the evolution of herbivore resistance in tropical marine communities?

Journal: Oecologia

Volume: 64

Pages: 396-407

Short Title: Predictable spatial escapes from herbivory: how do these affect the evolution of herbivore resistance in tropical marine communities?

Legal Note: Kenya

Abstract: Between-habitat differences in macrophyte consumption by herbivorous fishes were examined on three Caribbean and two Indian Ocean coral reefs. Transplanted sections of seagrasses were used as a bioassay to compare removal rates in reef-slope, reef-flat, sand-plain,

and lagoon habitats. Herbivore susceptibility of fifty-two species of seaweeds from these habitats was also measured in the field. Seagrass consumption on shallow reef slopes was always significantly greater than on shallow reef flats, deep sand plains, or sandy lagoons. Reef-slope seaweeds were consistently resistant to herbivory while reef-flat seaweeds were consistently very susceptible to herbivory. This pattern supports the hypothesis that defenses against herbivores are costly in terms of fitness and are selected against in habitats with predictably low rates of herbivory. Sand-plain and lagoon seaweeds showed a mixed response when placed in habitats with high herbivore pressure; most fleshy red seaweeds were eaten rapidly, most fleshy green seaweeds were eaten at intermediate rates, and most calcified green seaweeds were avoided or eaten at very low rates. Differences in susceptibility between red and green seaweeds from sand-plain or lagoon habitats may result from differential competitive pressures experienced by these seaweed groups or from the differential probability of being encountered by herbivores. The susceptibility of a species to removal by herbivorous fishes was relatively consistent between reefs. Preferences of the sea urchin *Diadema antillarum* were also similar to those of the fish guilds. Unique secondary metabolites were characteristic of almost all of the most herbivore resistant seaweeds. However, some of the herbivore susceptible species also contain chemicals that have been proposed as defensive compounds. Genera such as *Sargassum*, *Turbinaria*, *Thalassia*, *Halodule*, and *Thalassodendron*, which produce polyphenolics or phenolic acids, were consumed at high to intermediate rates, suggesting that these compounds are not effective deterrents for some herbivorous fishes. Additionally, potential for the production of the compounds caulerpin, caulerpicin and caulerpenyne in various species of *Caulerpa* did not assure low susceptibility to herbivory. Heavily calcified seaweeds were very resistant to herbivory, but all of these species also produce toxic secondary metabolites which makes it difficult to distinguish between the effects of morphological and chemical defenses. Predictions of susceptibility to herbivory based on algal toughness and external morphology were of limited value in explaining differing resistances to herbivory. © 1984 Springer-Verlag.

Notes: 6403

'File' Attachments: [internal-pdf://Oecologia \(1984\) 64 396-407-0548321536/Oecologia \(1984\) 64 396-407.pdf](internal-pdf://Oecologia (1984) 64 396-407-0548321536/Oecologia (1984) 64 396-407.pdf)

Language: English

Reference Type: Journal Article

Record Number: 404

Author: J. P. Barry, C. H. Baxter, R. D. Sagarin and S. E. Gilman

Year: 1995

Title: Climate-related, long-term faunal changes in a California rocky intertidal community.

Journal: Science

Volume: 267:

Pages: 672–675.

Short Title: Climate-related, long-term faunal changes in a California rocky intertidal community.

Legal Note: Kenya

Abstract: Changes in the invertebrate fauna of a California rocky intertidal community between

the period 1931 to 1933 and the period 1993 to 1994 indicate that species' ranges shifted northward, consistent with predictions of change associated with climate warming. Of 45 invertebrate species, the abundances of eight of nine southern species increased and the abundances of five of eight northern species decreased. No trend was evident for cosmopolitan species. Annual mean shoreline ocean temperatures at the site increased by 0.75°C during the past 60 years, and mean summer maximum temperatures from 1983 to 1993 were 2.2°C warmer than for the period 1921 to 1931

Notes: 6404

'File' Attachments: internal-pdf://Barry-0738295041/Barry.pdf

Language: English

Reference Type: Journal Article

Record Number: 405

Author: Z. Z. Finenko, S. A. Piontkovski, R. Williams and A. V. Mishonov

Year: 2003

Title: Variability of phytoplankton and mesozooplankton biomass in the subtropical and tropical Atlantic Ocean.

Journal: Marine Ecology Progress Series

Volume: 250

Pages: 125–144

Type of Article: Journal Article

Short Title: Variability of phytoplankton and mesozooplankton biomass in the subtropical and tropical Atlantic Ocean.

Alternate Journal: Inter-Research, Oldendorf, ALLEMAGNE

Legal Note: Kenya

Keywords: Marine environment ; Plankton ; Atlantic Ocean ; Tropical Atlantic Ocean ; Seasonal variation ; Spatial variability ; Secondary productivity ; Chlorophyll a ; Primary productivity ; Biomass ; Zooplankton ; Phytoplankton ;

Abstract: Data from over 40 yr (1950-1992) of expeditions to the Atlantic Ocean are summarised in the form of macroscale contour maps between 40°N and 40°S. The chl a concentrations from the surface and mesozooplankton in the upper layer (0 to 100 m) were analysed from 3992 casts and 1124 hauls respectively. General agreement between chlorophyll concentrations and mesozooplankton biomass distributions was noted on an ocean basin scale. There were non-linear relationships between mean chlorophyll concentration within the 0 to 10 m layer and mesozooplankton biomass within the 0 to 100 m layer for summed data between December to May and June to November. A comparison of the total biomass of mesozooplankton und phytoplankton, in carbon units, indicated that this ratio varied from 0.15 to 1 in the 0 to 100 m layer and, on average, the phytoplankton biomass exceeded twice that of mesozooplankton. The seasonal cycles of phyto- and zooplankton biomass for 6 provinces of the tropical zone were qualitatively comparable. Quantitative differences were found in the seasonal amplitudes, which were greater for the regions with nutrient enrichment of the upper layer. Relationships were established between phytoplankton and mesozooplankton biomass for 8 provinces

Notes: 6405

'File' Attachments: internal-pdf://Finenko-1595372800/Finenko.pdf

Language: English

Reference Type: Book

Record Number: 406

Author: D. H. Cushing

Year: 1975

Title: Marine ecology and fisheries

City: London

Publisher: Cambridge University Press

Pages: 278 pp

Short Title: Marine ecology and fisheries

Notes: 6406

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 407

Author: M. K. W. Osore, F. Fiers and M. H. Daro

Year: 2003

Title: Copepod composition, abundance and diversity in Makupa Creek, Mombasa, Kenya

Journal: Western Indian Ocean Journal Of Marine Science

Volume: 2

Issue: 1

Pages: 65-73

Short Title: Copepod composition, abundance and diversity in Makupa Creek, Mombasa, Kenya

Legal Note: Kenya

Keywords: Copepods, marine pollution, mangroves, Makupa creek, Mombasa Harbour, monsoons

Abstract: The taxonomic composition, abundance and spatio-temporal distribution of copepods were analysed from monthly zooplankton samples collected in Makupa creek and Mombasa Harbour (Makupa creek was until recently subjected to considerable dumping of domestic and industrial waste). At least 51 copepod species belonging to 38 genera in the families Calanoida (25), Harpacticoida (5), Poecilostomatoida (7) and Cyclopoida (1) were identified. The most common genera were Acartia, Acrocalanus, Corycaeus, Oncaea and Oithona. Copepods bloomed in the wet months of November and April (75 to 158/m³). Abundance was consistently high near the creek mouth and low within the creek enclosure. Copepod diversity (H') was slightly higher (2.00 to 2.57) during September, November, December, January, May and June and lower (1.30 to 1.95) in the remaining months. Evenness (J) was, however, relatively constant (0.67 to 0.84) during the entire sampling period. These results point to suppressed copepod diversity and abundance in Makupa Creek, and possible reasons for this, which may include environmental degradation caused by pollution, are presented.

Notes: 6407

'File' Attachments: internal-pdf://Osore-2913868288/Osore.pdf

Language: English

Reference Type: Journal Article

Record Number: 408

Author: M. K. W. Osore

Year: 1992

Title: A note on the zooplankton distribution and diversity in a tropical mangrove creek system, Gazi, Kenya

Journal: Hydrobiologia

Volume: 247

Issue: 1-3

Pages: 119-120

Short Title: A note on the zooplankton distribution and diversity in a tropical mangrove creek system, Gazi, Kenya

Legal Note: Kenya

Abstract: Gazi Creek is situated at some 40 km south of Mombasa (Kenya 4° 25' S, 39° 50' E) sampling stations are located in the creek mouth (stn 1), in the inner creek (stn 3) and intermediate (stn 2). Sampling is done twice a month; it starts from stn 1 through stn 2 up to stn 3. A 335 µm Mesh size net is towed in near surface water for 5 minutes and the collected sample preserved in 5% formaldehyde. Hydrographic parameters are recorded during sampling. The work at Gazi is undertaken to survey the Zooplankton composition both qualitatively and quantitatively. 22 important taxa have been studied to determine their seasonal variation in abundance and distribution. Zooplankton population are highest in March (374 animals m⁻³). The abundance gradually falls during the S.E. monsoon period (May-September) to the lowest value in August (30 animals m⁻³) (see Fig. 1). Copepoda is the most abundant taxon throughout (48.5-92.4%) (see Table 1). This group is found throughout the creek. Nevertheless, it is evident that the creek mouth has a higher diversity of copepoda compared to the inner creek. Using the Margalef Index a consistently higher value has been observed in stn 1 compared to stn 3 (see Table 2). The surface water temperature decreases during the S.E. monsoon (28.0 to 25.5 °C) and it rises during the N.E. monsoon (29.0 to 35.5 °C). The trend in temperature variation corresponds broadly with zooplankton abundance (see Fig. 1), suggesting that zooplankton thrive best in warmer water. High Zooplankton counts were also observed around May (326 animals m⁻³) during the long rains; probably due to high amounts of nutrients input. Generally, average monthly pH values vary only slightly but the pH up the creek is almost always lower than at the creek mouth. Salinity is quite constant at 35‰

Notes: 6408

'File' Attachments: internal-pdf://Osore_119-120-3473914880/Osore_119-120.pdf

Language: English

Reference Type: Journal Article

Record Number: 409

Author: M. K. W. Osore, F. Fiers and M. H. Daro

Year: 2004

Title: Distribution and Abundance of *Candacia* Dana, 1846 and *Paracandacia* Grice, 1963

(Copepoda, Calanoida, Candaciidae) off the Kenya Coast

Journal: Western Indian Ocean Journal of Marine Science

Volume: 3

Issue: 2

Pages: 189-197

Date: 2004

Type of Article: Journal Article

Short Title: Western Indian Ocean J. Mar. Sci.

ISSN: 0856-860x

Legal Note: Kenya

Keywords: Systematics

Distribution

Abundance

Monsoon

Kenya

Abstract: The distribution and abundance of copepods belonging to the genera *Candacia* and *Paracandacia* (family Candaciidae) within the inshore, shelf and offshore waters of the Kenya coast are presented. The copepod species are widely distributed, at low abundances (9 to 240 ind.100/m³) within the inshore waters, which increases to a maximum (40 to 360 ind.100/m³) within the shelf waters and decreases again to minimum (10 to 40 ind.100/m³) in the open ocean. They are more abundant during the southeast monsoon period and less so during the northeast monsoon. Abundance decreases with increasing depth, from a maximum of 880 ind.100/m³ at the surface to a minimum of 10 ind.100/m³ in the deep layers. The Candaciidae are least abundant at the depths ranging of 400 to 800 m, where oxygen concentration is minimum. In this study, *Candacia bradyi* A. Scott, 1902; *C. bipinnata* Giesbrecht, 1889; *C. curta* (Dana, 1849); *C. tuberculata* Wolfenden, 1905 and *C. ethiopica* (Dana, 1849) are reported as new records for the Kenyan coast.

Notes: 6409

URL: ajol.info/index.php/wiojms/article/view/28461/5142

'File' Attachments: internal-pdf://28461-16188-1-PB-1384818176/28461-16188-1-PB.pdf

Author Address: Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya

Language: English

Reference Type: Journal Article

Record Number: 410

Author: M. K. W. Osore, M. L. M. Tackx and M. H. Daro

Year: 1997

Title: The effect of rainfall and tidal rhythm on the community structure and abundance of the zooplankton of Gazi Bay, Kenya

Journal: Hydrobiologia

Volume: 356

Pages: 117–126

Short Title: The effect of rainfall and tidal rhythm on the community structure and abundance

of the zooplankton of Gazi Bay, Kenya

Legal Note: Kenya

Keywords: Mangrove creek, Zooplankton, TWINSPAN, Rainfall, Tides, Kenya

Abstract: Over a two-year study period, zooplankton was sampled in Gazi Bay, Kenya, using a 335µm mesh size Bongo net. Two Way Indicator Species Analysis (TWINSPAN) classification technique demonstrated that rainfall and tidal regime had substantial influence on the zooplankton community structure. Samples collected during the rainy season months clustered together when treated with TWINSPAN. Furthermore, the clustering was more pronounced for neap tide samples than for spring tide ones. Samples obtained during spring tide did not give a clear-cut pattern. Canonical Correspondence Analysis (C.C.A.) confirmed these findings, a clustering together of rainy/neap tide samples; and little separation (based on environmental variables) between sampling stations.

Notes: 6410

'File' Attachments: <internal-pdf://Osore1997-0417158144/Osore1997.pdf>

Language: English

Reference Type: Journal Article

Record Number: 411

Author: B. M. Mwashote, B. O. Ohowa and P. O. Wawiye

Year: 2005

Title: Spatial and temporal distribution of dissolved inorganic nutrients and phytoplankton in Mida Creek, Kenya

Journal: Wetlands Ecology and Management

Volume: 13

Pages: 599–614

Date: 2005

Type of Article: Journal Article

Short Title: Spatial and temporal distribution of dissolved inorganic nutrients and phytoplankton in Mida Creek, Kenya

DOI: DOI: 10.1007/s11273-003-5003-1

Legal Note: Kenya

Keywords: Distribution

Nutrients

Phytoplankton

Spatial

Temporal

Kenya, Mida creek

Abstract: The spatial and temporal distributions of dissolved inorganic nutrients were investigated between May 1996 and April 1997 in Mida Creek, a mangrove area along the north coast region of Kenya. The nutrient levels of pore water from boreholes/wells within the surrounding area of the creek were also investigated for comparison. In addition, phytoplankton distribution in Mida Creek was assessed in three stations within the creek in order to determine the structure and succession stages of the phytoplankton community and to provide an indication of the status of primary productivity of the creek. Measurements carried

out within the creek revealed that the mean concentration ranges for NH_4^+-N , $(\text{NO}_2^-+\text{NO}_3^-)-\text{N}$, $\text{PO}_4^{3-}-\text{P}$ and $\text{SiO}_3^{2-}-\text{Si}$ were: 0.002-5.45; 0.12-5.63; 0.10-0.58 and 1.31-81.36 μM , respectively. For the case of boreholes/wells found in the surrounding area, their respective nutrient levels were found to lie in the ranges 0.4-907.0; 16.7-4897.0; 1.09-22.39 and 83.9-596.0 μM . A total of 295 species of phytoplankton belonging to 78 genera were identified with great temporal variability in abundance in all the stations sampled. The most dominant algal members in the Creek included *Chaetoceros* spp., *Chroococcus* limneticus and *Oscillatoria* spp. The diversity values recorded were indicative of mesotrophic conditions. The highest nutrient concentration levels within the creek were measured during the wet season as compared to dry season and this trend closely corresponded with that of the phytoplankton productivity. However, no significant variation ($p>0.05$) was found in all cases with respect to the tidal cycles. On the contrary, diurnal nutrient concentrations especially in areas with high flooding duration (>12 h) were found to be highest during the dry season as opposed to wet season for all nutrients except for SiO_3^{2-} . The relatively high nutrient laden groundwater outflow into the creek water, coupled with surface runoff events during wet season, are the two main factors responsible for the elevated nutrients in the creek waters in the absence of river inflow into the creek.

Notes: 6411

'File' Attachments: <internal-pdf://Wawiye05-2654526720/Wawiye05.pdf>

Author Address: Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya

Language: English

Reference Type: Journal Article

Record Number: 412

Author: M. K. W. Osore, J. M. Mwaluma, F. Fiers and DaroM.H.

Year: 2004

Title: Zooplankton Composition and Abundance in Mida Creek, Kenya

Journal: Zoological studies

Volume: 43

Issue: 2

Pages: 415-424

Short Title: Zooplankton Composition and Abundance in Mida Creek, Kenya

Legal Note: Kenya

Keywords: Mangroves, Copepods, Tidal cycle, Diel cycle.

Abstract: Zooplankton composition and abundance in Mida Creek, Kenya. *Zoological Studies* 43(2): 415-424. In order to determine the resident assemblages of zooplankton in Mida Creek, Kenya, a survey was conducted from May 1996 to Apr. 1997 for which we studied their seasonal composition, abundance, and distribution. Twenty-seven major zooplankton taxa were identified. The order Copepoda was the most abundant taxon dominated mainly by the genera *Acartia*, *Paracalanus*, *Labidocera*, *Temora*, *Centropages*, and *Calanopia*. Other common zooplankton taxa included the *Medusae*, *Ctenophora*, *Brachyura* larvae, and *Chaetognatha*. The highest abundances (1961 ± 540 to 2856 ± 788 individuals/ m^3) were recorded during the dry season from Feb. to Mar., while the lowest ones (77 ± 21 to 352 ± 98 individuals/ m^3) were seen in the wet season from May to July. Vertical migration and the tidal cycle were the main factors

affecting variations in diel zooplankton abundance and diversity. However, the monthly composition of the taxa varied only minimally.

Notes: 6412

URL: <http://www.sinica.edu.tw/zool/zoolstud/43.2/415.pdf>

'File' Attachments: internal-pdf://Osore3-0086454528/Osore3.pdf

Language: English

Reference Type: Book

Record Number: 413

Author: G. Hansen, J. Turquet, J. P. Guod, L. Ten Hage, C. Lugomela, M. Kyewalyanga, M. Hurbungs, P. Wawiye, B. Ogongo, S. Tunje and H. Rakotoarinanahary

Year: 2001

Title: Potential harmful microalgae of western Indian ocean- a guide based on preliminary survey.

City: Place de Fontenoy

Publisher: United Nations Educational, scientific and Cultural Organization

Series Volume: IOC manual and guide number 41

Short Title: Potential harmful microalgae of western Indian ocean- a guide based on preliminary survey.

Keywords: Harmful Algal Blooms

Notes: 6413

URL: <unesdoc.unesco.org/images/0012/001266/126624m.pdf>

'File' Attachments: internal-pdf://126624m-4222282496/126624m.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 414

Author: E. O. Okuku

Year: 2008

Title: South Coast Technical report 2007/2008

City: Mombasa

Institution: KMFRI

Publisher: KMFRI

Type: Report

Short Title: South Coast Technical report 2007/2008

Notes: 6414

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 415

Author: J. Mwaluma

Year: 2002

Title: Ungwana Bay report

City: Mombasa

Institution: KMFRI

Short Title: Ungwana Bay report

Notes: 6415

'File' Attachments: internal-pdf://Ungwana2002-1063205888/Ungwana2002.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 416

Author: S. Mengesha, F. Dehairs, M. Elskens and L. Goeyens

Year: 1999

Title: Phytoplankton Nitrogen Nutrition in the western Indian ocean: Ecophysiological Adaptations of Neritic and Oceanic Assemblages to Ammonium Supply

Journal: Estuarine, Coastal and Shelf Science

Volume: 48:

Pages: 589-598

Short Title: Phytoplankton Nitrogen Nutrition in the western Indian ocean: Ecophysiological Adaptations of Neritic and Oceanic Assemblages to Ammonium Supply

Legal Note: Kenya

Keywords: nitrogen uptake; ammonium; f-ratio, ecophysiological adaptations; monsoon; western Indian Ocean

Abstract: The nitrogen nutrition of the phytoplankton community in the neritic and oceanic waters of the western Indian Ocean was investigated during the south-east monsoon (June–July) and intermonsoon periods (November–December). The region is very oligotrophic, characterized by very low nutrient concentrations (surface $\text{NO}_3 < 0.5 \mu\text{M}$), low phytoplankton biomass ($\text{PON } 20.85 \mu\text{mol l}^{-1}$) and predominance of regenerated production (maximum f-ratio < 0.47). Ammonium was the major nitrogen substrate during the two seasons, supplying 53–99% of the phytoplankton's nitrogen requirement. Nevertheless, both the uptake of nitrate and its relative contribution to total nitrogen removal (f-ratio) were significantly higher during the intermonsoon period than during the south-east monsoon period. While nutrient concentrations and nitrate uptake rates varied little, ammonium uptake and regeneration rates as well as f-ratio values showed significant spatial variability (i.e. between neritic and oceanic regions), which reflected the difference in the plankton assemblage and its ecophysiology. The oceanic assemblage exhibited higher ammonium uptake capacity, tuned to the activity of an efficient regenerating community that supplied about 68% of the daily nitrogen requirement of the phytoplankton. Analysis of ammonium uptake in relation to seasonal changes in ammonium availability showed that the neritic and oceanic assemblages had different uptake responses. While the ammonium uptake rates of the neritic assemblage varied according to the ambient ammonium availability, the oceanic assemblage maintained a relatively high specific ammonium uptake rate throughout the two seasons despite large variations in ammonium availability. Maintaining a relatively high ammonium uptake rate in the oceanic stations is interpreted as a physiological adaptation to ammonium supply.

Notes: 6416

'File' Attachments: internal-pdf://103890[1]-4011776513/103890[1].pdf

Language: English

Reference Type: Thesis

Record Number: 417

Author: S. A. Moorjani

Year: 1978

Title: The ecology of marine algae of the Kenya coast

City: Nairobi

University: University of Nairobi

Degree: Ph. D.

Thesis Type: Ph. D. thesis

Short Title: The ecology of marine algae of the Kenya coast

Notes: 6417

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 418

Author: S. A. Moorjani

Year: 1979

Title: Seasonal changes in the marine algal flora of the Kenya coast

Conference Location: Bhavnagar, India

Publisher: Symposium on Marine Algae of the Indian Ocean Region

Type: Conference proceedings

Pub Place: Kenya

Notes: 6418

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 419

Author: S. A. Moorjani

Year: 1982

Title: Rocky shore zonation in Kenya: horizontal and vertical distribution patterns in the marine flora.

Conference Name: Coast. & Mar. Envir Red Sea, Gulf of Aden and Trop. West. Indian Ocean

Publisher: ALESCO/UNESCO

Volume: 2.

Pages: 453-467

Type: Conference Proceedings

Pub Place: Kenya

Notes: 6419

'File' Attachments: internal-pdf://Morjoonia[1]-0342884096/Morjoonia[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 420

Author: P. A. W. Abuodha and J. G. Kairo

Year: 2001

Title: Human-induced stresses on mangrove swamps along the Kenyan coast

Journal: Hydrobiologia

Volume: 458

Issue: 1-3

Pages: 255-265

Epub Date: Tuesday, November 02, 2004

Date: 2001

Type of Article: Journal Article

Short Title: Human-induced stresses on mangrove swamps along the Kenyan coast

ISSN: 0018-8158 (Print) 1573-5117 (Online)

DOI: 10.1023/A:1013130916811

Legal Note: Kenya

Keywords: Deforestation

oil pollution

mangrove conversion

sustainable management

Kenyan coastline

Abstract: Mangroves form important ecosystems in Kenya's coastal areas. They produce goods and services that are of environmental, ecological and economic importance to human society. However, mangroves are under continuing pressure from anthropogenic disturbances. A particular concern has been the clearing of mangrove areas to reclaim land for other uses such as aquaculture, salt manufacture, agriculture and housing. About 10 000 ha of mangrove areas have been cleared for salt manufacture between Ngomeni and Karawa, while in Lamu, close to 100 ha of mangrove forest was killed by dredged-up sediment that was deposited during the construction of the Mokowe sea jet. 100 ha of mangrove area have been converted for aquaculture at Ngomeni. At Gazi Bay, about 100 ha of mangrove forests was cleared for fuelwood and in Makupa Creek, Mombasa, 10 ha of mangroves died due to oil pollution. The total area lost is therefore 10 310 ha which represents about 20% of the total mangrove forest. In this paper, deforestation, conversion of mangrove areas for other land uses and pollution of mangrove swamps on the Kenyan coast are discussed and a call for sustainable use, and the government policies that will enable this, is made.

Notes: 6420

'File' Attachments: internal-pdf://Abuodha-3847382016/Abuodha.pdf

Author Address: Kenya Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya

Language: English

Reference Type: Book

Record Number: 421

Author: A. L. Bennun and P. Njoroge

Year: 1999

Title: Important Birds Areas in Kenya

City: Nairobi, Kenya

Publisher: East African Natural History Society

Type of Work: Book

Short Title: Important Birds Areas in Kenya

Keywords: Birds, habitats, IUCN, BirdLife, Endangered

Abstract: The book presents details of Kenya's 61 area in Kenya that are considered Important Bird Areas (IBA). These areas are so designated using international guidelines and criteria prescribed by BirdLife International. Using these, an area may be an IBA on either one or all of four criteria: holding more than 1% of a biogeographic population of a species; holding species that are restricted to a particular biome only; holding species that are restricted to one range only or, holding a species or species that are globally endangered. The book/directory outlines accounts of each of the 61 IBAs in Kenya in detail of location, size, habitat types, all important bird species, other wildlife and conservation issues they face. These include the IBAs along the Kenyan coast as well as 5 other potential IBAs

Notes: 6421

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Web Page

Record Number: 422

Author: B. International

Year: 2009

Title: *Sterna fuscata*

Publisher: BirdLife International

Access Year: 2009

Type of Medium: <http://www.birdlife.org/>

Short Title: *Sterna fuscata*

Year Cited: Kenya

Date Cited: Birds

Keywords: *Sterna fuscata*

Abstract: The article presents details of the species *Sterna fuscata* including taxonomy, ecological attributes, estimates of global population, its global range and conservation challenges facing it

Notes: 6422

URL: <http://www.birdlife.org/>

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Web Page

Record Number: 423

Author: B. International

Year: 2009

Title: Global Important Bird Area selection criteria

Publisher: BirdLife International

Access Year: 2009

Type of Medium: On-line article

Short Title: Global Important Bird Area selection criteria

Year Cited: Kenya

Date Cited: Birds

Keywords: IBA; Criteria; designation

Abstract: The article describes the criteria under which an area may be designated as an Important Bird Area. These are global threats, range-restriction, biome-restriction and congregations of at least 1% of a bio-geographic population.

Notes: 6423

URL: <http://www.birdlife.org/>

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 424

Author: S. Caut, E. Angulo and F. Courchamp

Year: 2007

Title: Dietary shift of an invasive predator: rats, seabirds and sea turtles

Journal: Journal of Applied Ecology/British Ecological Society

Type of Article: Journal Article

Short Title: Dietary shift of an invasive predator: rats, seabirds and sea turtles

Legal Note: Kenya

Keywords: Alien invasive species, *Chelonia mydas*, conventional diet, *Rattus rattus*

Abstract:

Rats have reached about 80% of the world's islands and are among the most successful invasive mammals. Rats are opportunistic predators that are notorious for their impact on a variety of animal and plant species. However, little documented evidence on the complexities of these interactions is available. In our study, we assessed the impact of black rats *Rattus rattus* introduced on a small uninhabited island with a relatively simple ecosystem, Surprise Island, New Caledonia. We also compared the diet of *R. rattus* in the presence and absence of breeding seabirds, assessing the dietary compensation for this potentially important food source. From 2002 to 2005, we used live trapping studies combined with stable isotope analysis and conventional diet analyses (direct observations, gut and faecal contents) to characterize the diet of rats. Our results suggest a heavy predatory impact on seabirds, which could constitute as much as 24% of the rat diet. Moreover, in the absence of birds, rats compensated marginally by preying more heavily on other components of their diet but mostly acquired a new resource. They shifted their diet by preying heavily upon another endangered species, the

hatchlings of sea turtles *Chelonia mydas*, which could constitute the main resource in the diet of *R. rattus* in those periods. Abundance, body condition and distribution of the rats were consistent with heavy predation upon this additional resource. Synthesis and applications. In island ecosystems invasive rats prey mainly upon seabird eggs and chicks, thereby threatening their populations. Although rats are certainly capable of surviving on terrestrial foods outside the seabird nesting season, their ability to prey upon ephemeral but abundant resources, such as hatchling sea turtles, may contribute to maintaining their populations. This may explain their success on Surprise Island, an ecosystem of extreme conditions, and suggests that biologists and managers working with threatened species should be aware of the possibility of temporary diet shifts by introduced rodents that may cause unexpected heavy predation on these species. This dietary shift from one endangered taxa to another has major implications for the conservation of seabirds and sea turtles world-wide and more generally for the biodiversity of invaded insular communities.

Notes: 6424

URL: <http://www.birdlife.org/>

'File' Attachments: internal-pdf://Caut-2953773824/Caut.pdf

Language: English

Reference Type: Web Page

Record Number: 425

Author: C. R. Forum

Year: 2009

Title: Malindi District Background Information: Poverty index

Publisher: Coast Rights Forum

Short Title: Malindi District Background Information: Poverty index

Year Cited: Kenya

Keywords: Poverty Index, Malindi, Coast

Abstract: The article outlines the socio-economic status/situation among indigenous Kenyan coastal communities especially in Malindi District including the demographic and population profile as well as poverty index there

Notes: 6425

URL: <http://coastrightsforum.org/index>

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Report

Record Number: 426

Author: C. o. Australia

Year: 2008

Title: Seabirds and shorebirds in the Great Barrier Reef World Heritage area in a changing climate

City: Queensland, Australia

Publisher: G. B. R. M. Authority

Type: Workshop report

Short Title: Seabirds and shorebirds in the Great Barrier Reef World Heritage area in a changing climate

Abstract: Seabirds have been identified as a highly vulnerable species group under a changing climate. Emerging research has shown that seabird populations can respond to precursors of major climatic events. Giving priority to analyses and further research that can further reveal the predictive potential of seabird trends will provide a valuable tool in the quest to understand and mitigate the effects of climate change.

Notes: 6426

'File' Attachments:

internal-pdf://Seabirds-changing-climate[1]-0526589696/Seabirds-changing-climate[1].pdf

Language: English

Reference Type: Web Page

Record Number: 427

Author: C. S. Institute

Year: 2009

Title: Destructive fishing practices

Publisher: http://www.conservatinstitute.org/ocean_change/Fisheries

Type of Medium: On-line article

Short Title: Destructive fishing practices

Year Cited: Kenya

Date Cited: Fish

Keywords: Long-line fishing, bycatch, trawling, impacts

Abstract: Longline fishing consists of baited hooks on lines up to 80 miles long. Each longline can have more than several thousand hooks at a time. These may catch swordfish, tuna, sharks, birds, and turtles. Worldwide, an estimated 180,000 birds die on longline hooks each year, many of which are endangered and nearing extinction. About 10% of the world's endangered wandering albatross population is killed each year by longlines. According to Bird International, in 1996, just three albatross species were threatened, but today all 21 species are at risk of extinction. A number of petrel species also face extinction, and all these sea birds are at risk as a result of longlining. Fishermen can minimize conflicts with seabirds by putting extra weight on lines to make bait sink faster, by setting hooks at night, and by using streamer lines that scare birds away. In some areas sharks have also been severely impacted by longline fishing. In 1998, 60,857 sharks were killed in Hawaiian longline fisheries. Sharks have slow growth and reproductive rates, which makes them particularly vulnerable to overfishing

Notes: 6427

URL: http://www.conservatinstitute.org/ocean_change/Fisheries

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 428

Author: M. A. C. Coverdale, J. Hancock and D. J. Pearson

Year: 1983

Title: Unusual December-January breeding at the Garsen heronry, Kenya

Journal: Scopus

Type of Article: Journal paper

Short Title: Unusual December-January breeding at the Garsen heronry, Kenya

Legal Note: Kenya

Keywords: IBA; Criteria; designation

Abstract: The article describes the observations of breeding activity of some water birds in a captive site (heronry) in Kenya

Notes: 6428

Language: English

Reference Type: Book Section

Record Number: 429

Author: B. Fulanda

Year: 2003

Title: Shrimp trawling in Ungwana Bay: A threat to fishery resources

Book Title: Recent Advances in Coastal Ecology: Studies from Kenya

Short Title: Shrimp trawling in Ungwana Bay: A threat to fishery resources

Section: Kenya

Keywords: Shrimp trawling in Ungwana Bay: A threat to fishery resources

Abstract: This paper examines the landings of three trawlers fishing the Ungwana Bay over a seven-day period totalling about 200 hrs fishing time. A critical analysis is made of the catch and its composition in terms of marketable catch (target species and commercial fish) and by-catch (non-commercial fish, juveniles and debris). Prawns made up 13.7% of the catch while commercial fish amounted to 14.4% of the total. The remainder (71.9%) comprised of by-catch. Further breakdown showed that non-commercial fish made up the bulk of the by-catch with 42.9%. This group included Branchyura, Apogonidae, Leiognathidae, Squillidae and Gobiidae families. Juveniles accounted for 23.6% of the by-catch. The latter consisted for almost two-thirds of juveniles of commercial fish among which Ariidae were the commonest. Other families included Atherinidae and Carangidae. In the shallow 'Kipini' area, trawling does considerable damage to the benthic fauna and flora. The trawling attracts a large population of piscivorous birds creating artificial and unstable food webs. A Turtle Excluder Device (Anthony Weedless) was used on one of the trawlers but it appeared to result in lower catch of commercial fish allowing only small species and undersized fish into the cod end. It is concluded that the trawlers pose a threat to both the Ungwana fishery and other marine resources.

Notes: 6429

'File' Attachments: internal-pdf://ASC-1253933-067[1]-2057547776/ASC-1253933-067[1].pdf

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 430

Author: F. Goethe

Year: 1968

Title: The effects of oil pollution on populations of marine and coastal birds

Journal: Helgoland Marine Research

Volume: 17

Issue: 1-4

Pages: 370-374

Type of Article: Journal paper

Short Title: The effects of oil pollution on populations of marine and coastal birds

Legal Note: Kenya

Keywords: Oil pollution; marine and coastal birds

Abstract: Oil pollution of the sea, especially damage of oil tankers, may cause severe effects on populations of sea and coastal birds, especially as far as bird aggregations in winter quarters or breeding places are concerned. 2. Examples of oil pollution effects on birds are given and the most severely affected species of European waters quoted.

Notes: 6430

Language: English

Reference Type: Journal Article

Record Number: 431

Author: IUCN

Year: 2004

Title: Managing Marine Protected Areas: A Toolkit for the Western Indian Ocean

Journal: IUCN Eastern African Regional Programme

Type of Article: A manual/toolkit

Short Title: Managing Marine Protected Areas: A Toolkit for the Western Indian Ocean

Legal Note: Kenya

Keywords: Marine Protected Area management

Abstract: Marine protected areas (MPAs) have been established throughout the world for a variety of purposes such as conservation, tourism and education. At the time of producing this Toolkit there are more than 70 individual sites (nationally and internationally designated), in the Western Indian Ocean (WIO), over which some form of management exists. Most of these sites are managed under formal government mandates while some correspond to traditional or localised arrangements, and span the spectrum from fully protected "no take" areas to multiple use areas. Every country in the region now has one or more MPAs and the number is on the increase. The "revitalization" of the Convention for the Protection, Management, and Development of the Marine and Coastal Environment in Eastern Africa (the Nairobi Convention, adopted in 1985) has contributed significantly to this increase and has also resulted in the establishment of the Group of Experts on Marine Protected Areas in Eastern Africa (GEMPA-EA), hosted jointly by the United Nations Environment Programme (UNEP) and the Western Indian Ocean Marine Science Association (WIOMSA). A number of other regional initiatives have also contributed to the progress in MPA establishment and management, including: A Norwegian Agency for Development Co-operation (NORAD)-funded project - Progress in the development of a partnership programme for implementing the Jakarta Mandate (the WIO Marine Biodiversity Conservation Project), which has identified MPAs as a priority theme for attention. The Coastal Zone Management Centre (CZMC) of the Netherlands - supported project on

Capacity building in MPA management in the Western Indian Ocean region. Implemented in collaboration with WIOMSA, the project aimed at providing training in skills, techniques and tools necessary for effective management of MPAs in the region. World Wide Fund for Nature (WWF)'s Eastern African Marine Ecoregion (EAME) Programme, which covers the mainland coast from southern Somalia to the northern coast of South Africa, and promotes, amongst others, the establishment of a regional representative network of MPAs based on the ecosystem approach. IUCN's Eastern Africa Regional Programme (EARP) initiated the WIO Marine Biodiversity Conservation Project in 2000 with a range of partners, to assist with implementation of the Jakarta Mandate within the Eastern African region. The project is led by a Task Force representing six of the Parties to the Nairobi Convention, as well as a number of regional organisations including WIOMSA, UNEP, WWF and IUCN/EARP. The project also provides a mechanism for assisting with implementation of the Nairobi Convention, since the Convention and the Jakarta Mandate share similar objectives. The Nairobi Convention calls upon the Contracting Parties to 'formulate and adopt guidelines, standards or criteria concerning the identification, selection, establishment and management of protected areas'. Furthermore, the Biennial (2000-2001) Work Programme of the Nairobi Convention proposed that existing MPA global guidelines should be 'regionalised' with the intention of improving their relevance to the situation in the WIO region. The Task Force of the WIO Marine Biodiversity Conservation Project therefore suggested that such guidelines could be prepared as one of the Project's activities. A "needs assessment" was first undertaken to determine more precisely the requirements of MPAs in the region. The assessment, which was based on questionnaires, email correspondence and focused discussions, involved a range of practitioners and experts from within and outside the region, and benefited from contributions from members of the Task Force and GEMPA-EA. The assessment revealed that MPA managers and practitioners felt that many guidelines, training manuals and other relevant materials already exist and largely fulfill their intended purposes. However, the remote locations of many of the WIO MPAs, and their inadequate funding and communication facilities, mean that they have very limited access to simple and practical information. It was therefore recommended that a Toolkit be prepared to assist MPA managers and practitioners access existing information relating to all stages of MPA establishment and management, including site selection, planning, day-to-day management, sustainable financing, management effectiveness and monitoring and evaluation. The Toolkit is designed to complement and build on the "Regional Training Course in Marine Protected Areas Management in the Western Indian Ocean Region" and a manual entitled "Training for the sustainable management of Marine Protected Areas: A training manual for MPA managers". The Toolkit aims to act as a first point of call in the search for information on issues that MPA managers and practitioners face in day-to-day operations. The Toolkit reflects work by many individuals and organizations that, over a period of three years, have collaborated together on conception of the idea, to the writing of theme sheets, to reviewing them. We hope this collaboration will continue since the production of this Toolkit is a small step forward in our long march to improve the management effectiveness of the MPAs in the WIO region.

Notes: 6431

URL: www.wio-compas.org/files/mpa_toolkit_wio.pdf

'File' Attachments: internal-pdf://mpa_toolkit_wio-1841199872/mpa_toolkit_wio.pdf

Language: English

Reference Type: Report

Record Number: 432

Author: J. M. Kazungu, D. Munga, P. Gwada, S. Mwanguni and J. Ochiwo

Year: 2001

Title: Socio-economic root causes of biodiversity loss in the priority sites of the East African marine eco-region

City: Nairobi

Publisher: W. W. F. f. N. W. E. A. M. Ecoregion

Type: Project report

Short Title: Socio-economic root causes of biodiversity loss in the priority sites of the East African marine eco-region

Keywords: Socio-economics; biodiversity loss; Lamu-Kiunga; Mida- Malindi

Abstract: This report is an output of the analysis of the root causes of biodiversity loss in the WWF Eastern African Marine Ecoregion (EAME), focusing on the sites of global significance in Kenya, namely Lamu-Kiunga and Mida-Malindi. The output is a contribution to the EAME process with the aim of developing an appropriate conservation strategy for the region. The Kenyan coast, rich in biodiversity, supports livelihood earnings for the local community and to the economy of the country. Currently, biodiversity experiences a lot of pressure from the rapidly growing population and associated human activities, among other pressures

Notes: 6432

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Web Page

Record Number: 433

Author: KenSea

Year: 2006

Title: Environmental Sensitivity Atlas for Coastal Area of Kenya

City: Grønland

Publisher: De Nationale Geologiske Undersøgelser

Short Title: Environmental Sensitivity Atlas for Coastal Area of Kenya

Year Cited: Kenya

Date Cited: Birds

Keywords: Socio-economics; biodiversity loss; Lamu-Kiunga; Mida- Malindi

Abstract: Coastal birds concentrate usually on intertidal areas. Especially mudflats, but also estuaries, reef flats, and beach cast of seagrass debris may attract waders and gulls. Terns are often attracted to shallow or turbulent waters. The Kenyan coast does not host any globally threatened species but e.g. the Mida Creek area, and the Kiunga reserve hosts important numbers of crab- plovers, and roseate tern nests on several of the smaller islands. The coast host a number of Palearctic immigrant waders during the Palearctic winter between September and March. Although waders and terns are less sensitive to oil pollution than swimming sea birds as e.g. auks and ducks, an oil spill near important bird areas, may affect the birds directly

(Oil contact) and indirectly by disturbing the feeding ground.

Notes: 6433

URL: www.geus.dk/program-areas/nature-environment/international/reports/kensea

'File' Attachments: internal-pdf://kensea_rapport-0886939648/kensea_rapport.pdf

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 434

Author: S. C. Mangi and C. M. Roberts

Year: 2006

Title: Quantifying the environmental impacts of artisanal fishing gear on Kenya's coral reef ecosystems

Journal: Marine Pollution Bulletin

Volume: 52

Pages: 1646-1660

Date: 2006

Type of Article: Journal Article

Short Title: Quantifying the environmental impacts of artisanal fishing gear on Kenya's coral reef ecosystems

Legal Note: Kenya

Keywords: Fisheries management

Fish trap

Beach seine

Spear gun

Gill net

Marine reserve

fish biomass

fish stock

productivity

Abstract: The environmental impacts of artisanal fishing gear on coral reef ecosystems were studied in the multi-gear fishery of southern Kenya to evaluate which types of gear have the greatest impact on coral reef biodiversity. The gear types studied were large and small traps, gill nets, beach seines, hand lines and spear guns. Levels of coral damage, proportion of juvenile fish and discards, size and maturity stage at first capture were quantified and compared amongst the gear types. Results indicate that fishers using beach seines, spears and gill nets cause the most direct physical damage to corals. Spear fishers showed the highest number of contacts to live corals per unit catch followed by fishers using gill nets (12.6 ± 1.8 and 5.9 ± 2.0 coral contacts per kg fish caught per trip respectively). Apart from discarding 6.5% of their daily catch in the sea, as it was too small, beach seine fishers also landed the highest percentage of juvenile fish ($68.4 \pm 15.7\%$), a proportion significantly higher ($p < 0.001$) than in any other gear. The size and maturity stage at first capture for 150 of 195 species caught by all gear types was well below the lengths at which they mature. For example, 100% of *Lethrinus xanthurus*, 99% of *Lethrinus nebulosus* and 94% of *Lethrinus harak* caught were juveniles. Across all gear types,

50.1 ± 22.7% of the catch consisted of juvenile fish, indicating serious growth overfishing. Field assessment of levels of coral density showed that fishing grounds where beach seines were still in use had a significantly lower density than where beach seining was not used. This correlation is likely to arise in part because seines cannot be used in the most coral rich areas, and in part because coral loss is a consequence of seine use. On a per gear basis therefore, beach seines had the most impact on coral reef biodiversity. This study emphasizes the need to enforce restrictions on destructive gear and mesh sizes.

Notes: 6434

'File' Attachments: <internal-pdf://Mangi06-0127438848/Mangi06.pdf>

Language: English

Reference Type: Report

Record Number: 435

Author: S. N. Musila, M. Ogoma, R. K. Mulwa, F. Ngweno and P. Matiku

Year: 2005

Title: Kenya's Important Bird Areas: Status and trends 2005

City: Nairobi, Kenya

Publisher: T. E. A. N. H. Society

Type: Annual Report

Short Title: Kenya's Important Bird Areas: Status and trends 2005

Keywords: IBAs, Kenya, Status and trends

Abstract: Sixty Important Bird Areas (IBAs) have been identified in Kenya. These sites are important for bird conservation, but by their very nature, also protect other living things – the biodiversity on which human survival depends. Many IBAs are already protected areas: for example, Arabuko-Sokoke Forest Reserve, which shelters six globally threatened bird species; or Lake Nakuru National Park with its vast numbers of flamingos and other waterbirds. Other Important Bird Areas, such as the densely populated valleys where the Kenya endemic Hinde's Babbler lives, are still unprotected. More information on IBAs can be found in the book *Important Bird Areas in Kenya* by Leon Bennun and Peter Njoroge, available at Nature Kenya and major bookshops. Additional research and analyses has shown that Important Bird Areas are also Key Biodiversity Areas (KBAs). That is, they are important for the conservation of other living things. For example, in the Eastern Arc and Coastal Forests of Kenya and Tanzania, 23 out of the 25 most important sites are IBAs (out of the 160 sites critical for conserving 333 globally threatened species,). More information is available on the Critical Ecosystems Partnership Fund website (www.cepf.net) under "ecosystem profile". In the past three years, a system of monitoring Important Bird Areas has been developed by Nature Kenya and implemented by Government agencies and local communities, thanks to funding by the Darwin Initiative of the UK, the Royal Society for the Protection of Birds, and BirdLife International. Monitoring is a vital part of taking action for the conservation of IBAs; it provides an early warning of emerging problems and helps to assess the effectiveness of conservation measures. The Kenya monitoring framework looks at the habitat, existing management practices, birds and other taxonomic groups to evaluate the conditions of the site. The information is collected by local communities, Government officers, Nature Kenya members and other visitors. It is then fed into the IBA computer database at the Ornithology

Department of the National Museums of Kenya by Nature Kenya Research Fellows based at the Department. Each year, the information is analysed and published in a report like this one. It can then be used by managers to better manage protected sites, and by local communities to guide their efforts on the ground. This report can also be used to report on Kenya's obligations under international agreements, such as the Convention on Biological Diversity; and provides a basis for evaluating the implementation of Kenya's National Biodiversity Strategy and Action Plans and for assessing progress towards the international target of significantly reducing biodiversity loss by 2010 and achievement of Millennium Development Goals (MDGs).

Notes: 6435

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Book Section

Record Number: 436

Author: M. Muthini, T. M.P. and D. Otieno

Year: 2003

Title: Solid Waste Pollution Loads in Beach Hotels on the Kenyan South Coast

Book Title: Recent Advances in Coastal Ecology: Studies from Kenya.

Number of Volumes: 70

Short Title: Solid Waste Pollution Loads in Beach Hotels on the Kenyan South Coast

Section: Kenya

Keywords: South Coast Solid waste, tourism, South Coast

Abstract: During the high tourist season between September 1996 and February 1997, solid waste types and quantities from six popular beach hotels in Mombasa and Diani were determined. The factors and processes that affect solid waste management in the region were examined and baseline data on quantities of waste generated in coast hotels are provided. The mean per-capita waste generation rate was found to be 1.90 kg/person/day and the relative proportions by weight of the respective waste categories were: paper 3.5%, plastics 3.3%, tins 1.7%, glass 4.5%, food waste 79.1%, cartons 2.0%, and residual waste 6.0%. The rates of generation of waste components were also calculated. The annual waste load was found to be 362 tons for Jadini Beach Hotel and Africana Sea Lodge; 200 tons for Leopard Beach Hotel; 159 tons for Diani Sea Lodge; 192 tons for Severin Sea Lodge and 150 tons for Mombasa Beach Hotel. Limited recycling, re-use and composting practices were undertaken by some of the hotels such as Mombasa Beach Hotel, Severin Sea Lodge and Diani Sea Lodge. Tins were re-used for planting tree seedlings and flowers. Glass waste and cartons were collected by dealers for recycling. Food waste was used to feed pigs. The results of the study make it possible to develop a feasible waste management concept for the hotels. There is potential for recycling, re-use and composting of the waste generated. It is recommended that hotels effectively separate waste at source to ensure high quality waste components for further processing. This will help to reduce the costs of waste disposal, minimise health risks and

Notes: 6436

'File' Attachments: internal-pdf://ASC-1253933-067[1]-1615335936/ASC-1253933-067[1].pdf

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Report

Record Number: 437

Author: A. Mwangura

Year: 2007

Title: Oil spill in Mombasa

City: Mombasa, Kenya

Publisher: S. A. Programme

Short Title: Oil spill in Mombasa

Keywords: Oil spill; Mombasa, Kenya. pollution, waste disposal, Kilindini, Tudor, Near shore, Currents, Salinity and temperature

Abstract: Coastal ecosystems are not only an important source for essential products for mankind, including foods, medicine, raw materials and recreational facilities, but also provide ecological services that directly benefit the coastal zone. Approximately 39 km of shoreline along which 27 fish landing sites located were polluted by oil of which 22 kilometers were heavily impacted. Shorelines consisted of a mixture of sand, pebbles and mangroves as well as seawalls. Fishing and Mari culture activities taken along the affected area included intertidal harvesting of marine products, inshore fishing with dugout canoes and set nets, crab culture farms and on shore hatcheries producing a range of marine products. Many of these activities also suffered the direct effects of the oil spill. Apart from the environmental damage to marine organisms and mangroves, the fishing communities also suffered heavily loss of income due to property damage caused by the oil spill.

Notes: 6437

URL: www.ecop.info/english/e-sap-net-31

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Report

Record Number: 438

Author: N. E. M. Authority

Year: 2007

Title: Integrated coastal zone management policy

City: Nairobi, Kenya

Institution: National Environment Management Authority

Publisher: N. E. M. Authority

Type: A draft policy report

Short Title: Integrated coastal zone management policy

Keywords: South Coast Solid waste, tourism, South Coast

Abstract: This is the integrated coastal zone management policy paper provides for the development of a coastal zone policy in Kenya. The framework is intended to guide actions and policies related to the use and management of Kenya's coastal zone resources, including their protection and restoration.

Notes: 6438

'File' Attachments:

internal-pdf://Policy_Draft_01_May_07-0941163008/Policy_Draft_01_May_07.pdf

Last Modified Date: Veronica Wanjeri

Language: Kenya

Reference Type: Report

Record Number: 439

Author: N. M. o. Kenya

Year: 2009

Title: Trends in water-bird numbers in wetlands of coast province, Kenya

City: Nairobi, Kenya

Institution: National Museums of Kenya

Type: Unpublished water-bird monitoring report

Short Title: Trends in water-bird numbers in wetlands of coast province, Kenya

Keywords: Waterbird trends, Coast, Kenya

Abstract: In a scheme initiated by the national Museums of Kenya in conjunction with the IUCN, KWS, Nature Kenya and the Kenya Wetlands Working Group, populations of water birds in Kenya's wetlands where many waterbirds congregate, have been estimated annually since the mid 1990s. This exercise has included Kenya's coastal wetlands which hosts both resident and migrant seabirds and shorebirds. The present report summarises trends in population estimates for the coastal wetland shorebirds and seabirds in general as well as narrowing the focus to members of the Laridae (Gulls and Sternidae (Terns), both of which together form the bulk of the seabirds in these habitats.

Notes: 6439

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 440

Author: B. Ohowa

Year: 2009

Title: Evaluation of the effectiveness of the regulatory regime in the management of oil pollution in Kenya

Journal: Ocean & Coastal Management

Volume: 52

Pages: 17-21

Date: 2009

Type of Article: Journal article

Short Title: Evaluation of the effectiveness of the regulatory regime in the management of oil pollution in Kenya

Legal Note: Kenya

Abstract: This paper presents an evaluation of the effectiveness of the regulatory regime in the management of oil pollution on Kenya's marine and coastal environment. The prospect of chronic oil pollution along the Kenyan coastline and the port of Mombasa is discussed. A review of the vulnerable marine and coastal resources, commonly used indicators of effectiveness in

oil pollution management and the legislation governing oil pollution is given. The author concludes by emphasising that despite having the right legislation in place, there is need for the establishment of criteria and indicators necessary for evaluation of policy effectiveness.

Notes: 6440

'File' Attachments: internal-pdf://Ohowa-3039073024/Ohowa.pdf

Language: English

Reference Type: Report

Record Number: 441

Author: N. E. Otieno, H. Oyieke and P. Kochey

Year: 2008

Title: Influence of anthropogenic activities on density and distribution of birds around Sabaki River estuary

City: Nairobi, Kenya

Institution: National Museums of Kenya

Type: Project report (Manuscript under peer review)

Short Title: Influence of anthropogenic activities on density and distribution of birds around Sabaki River estuary

Keywords: Anthropogenic activities; density; birds, Sabaki River; estuary; Kenya

Abstract: Effects of human activities and habitat structure on bird density and distribution were investigated at Sabaki River Estuary by the Indian Ocean Kenya. Sampling by habitat stratification, birds were surveyed along transects in terrestrial habitats by DISTANCE and along the river by encounter rates/km to determine abundance, diversity and species richness. Anthropogenic activity indices were derived and habitat structure determined from plant density, richness and habitat heterogeneity. Secchi depth, pH, water temperature and depth were measured along the river to gauge water quality. Bird density reduced with anthropogenic activity but neither across terrestrial habitats nor along the river, although bird diversity increased in the wet season. Bird density increased with that of crustaceans ($R = 0.8095$) though birds distribution was random across habitats. Cattle grazing reduced ground cover and vertical heterogeneity but the recovery of these in the wet season attracted increased human activity leading to bird disturbance despite boosting bird diversity. Bird and water quality variables were not significantly correlated but pH, which was higher in the dry season, had a negative correlation to crustacean abundance ($R = -0.9239$). Despite higher water turbidity in the wet season, variations along the river were insignificant. Formal protection would help conserve the estuary against uncontrolled access.

Notes: 6441

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 442

Author: T. Pye, R. Swain and R. D. Seppelt

Year: 1999

Title: Distribution and habitat use of the feral black rat (*Rattus rattus*) on subantarctic

Macquarie Island

Journal: Journal of Zoology (The Zoological Society of London)

Volume: 247

Pages: 429-438

Type of Article: Journal article

Short Title: Distribution and habitat use of the feral black rat (*Rattus rattus*) on subantarctic Macquarie Island

Legal Note: Kenya

Keywords: Distribution; habitat; introduced species; rats; *Rattus rattus*; subantarctic

Abstract: Macquarie Island is the southernmost limit to the distribution of the black rat *Rattus rattus*. The species was introduced to this subantarctic island by sealers during the 19th century. The rats are now widespread and abundant in coastal areas all around the island. The distribution of rat populations is divided into discrete units by the availability of suitable habitat which, in turn, is a consequence of the rugged topography, particularly on the west coast. Rats are found from almost sea level to 200–250 m a.s.l. and up to 1 km inland. They have adapted successfully to the rigorous climate and firmly occupy a habitat niche in an environment where food is plentiful, predators are few and interspecific competition minimal. The principal habitat, tall *Poa foliosa* tussock grassland, provides year-round shelter and food. Rats dig burrows in the peaty stools of the tussock plants and construct nesting chambers at the base of the dense leaf canopy. Predictably, this provides a warmer and more stable thermal environment than that experienced outside under the tussock canopy where the runs are located. Tussock grasslands are spreading under the influence of management control measures directed at the introduced European rabbit and possibly global warming. Management programmes are also directed towards the eradication of feral cats. In response, rat populations may be expected to expand in numbers and to occupy new territories. Without control this may, in the long term, have serious consequences for the island's avifauna, particularly the smaller, burrow-nesting species

Notes: 6442

'File' Attachments: [internal-pdf://Pye99\[1\]-2099021312/Pye99\[1\].pdf](internal-pdf://Pye99[1]-2099021312/Pye99[1].pdf)

Language: English

Reference Type: Report

Record Number: 443

Author: C. Rosenzweig, G. Casassa, D. J. Karoly, A. Imeson, C. Liu, A. Menzel, S. T. L. Rawlins, T. L. Root, B. Seguin and P. Tryjanowski

Year: 2007

Title: Assessment of observed changes and responses in natural and managed systems

City: Cambridge, UK

Institution: National Museums of Kenya

Publisher: C. U. Press

Type: Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,

Short Title: Assessment of observed changes and responses in natural and managed systems

Keywords: Climate change; changes; responses

Abstract: Physical and biological systems on all continents and in most oceans are already being

affected by recent climate changes, particularly regional temperature increases (very high confidence). Climatic effects on human systems, although more difficult to discern due to adaptation and non-climatic drivers, are emerging (medium confidence). Global-scale assessment of observed changes shows that it is likely that anthropogenic warming over the last three decades has had a discernible influence on many physical and biological systems [1.4]. Attribution of observed regional changes in natural and managed systems to anthropogenic climate change is complicated by the effects of natural climate variability and non-climate drivers (e.g., land-use change). Nevertheless, there have been several joint attribution studies that have linked responses in some physical and biological systems directly to anthropogenic climate change using climate, process and statistical models. Furthermore, the consistency of observed significant changes in physical and biological systems and observed significant warming across the globe very likely cannot be explained entirely by natural variability or other confounding non-climate factors. On the basis of this evidence, combined with the likely substantial anthropogenic warming over the past 50 years averaged over each continent except Antarctica (as described in the Working Group I Fourth Assessment Summary for Policymakers), it is likely that there is a discernible influence of anthropogenic warming on many physical and biological systems. Climate change is strongly affecting many aspects of systems related to snow, ice and frozen ground (including permafrost); emerging evidence shows changes in hydrological systems, water resources, coastal zones and oceans (high confidence).

Notes: 6443

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 444

Author: L. Stempniewicz, K. Błachowiak-Samołyk and J. M. Węsławski

Year: 2007

Title: Impact of climate change on zooplankton communities, seabird populations and arctic terrestrial ecosystem—A scenario

Journal: Deep Sea Research Part II: Topical Studies in Oceanography

Volume: 54

Issue: 23-26

Pages: 2934-2945

Type of Article: Journal article

Short Title: Impact of climate change on zooplankton communities, seabird populations and arctic terrestrial ecosystem—A scenario

DOI: doi:10.1016/j.dsr2.2007.08.012

Legal Note: Kenya

Keywords: Arctic; Climate change; Nutrients; Seabirds; Terrestrial ecosystems

Abstract: Many arctic terrestrial ecosystems suffer from a permanent deficiency of nutrients. Marine birds that forage at sea and breed on land can transport organic matter from the sea to land, and thus help to initiate and sustain terrestrial ecosystems. This organic matter initiates

the emergence of local tundra communities, increasing primary and secondary production and species diversity. Climate change will influence ocean circulation and the hydrologic regime, which will consequently lead to a restructuring of zooplankton communities between cold arctic waters, with a dominance of large zooplankton species, and Atlantic waters in which small species predominate. The dominance of large zooplankton favours plankton-eating seabirds, such as the little auk (*Alle alle*), while the presence of small zooplankton redirects the food chain to plankton-eating fish, up through to fish-eating birds (e.g., guillemots *Uria* sp.). Thus, in regions where the two water masses compete for dominance, such as in the Barents Sea, plankton-eating birds should dominate the avifauna in cold periods and recess in warmer periods, when fish-eaters should prevail. Therefore under future anthropogenic climate scenarios, there could be serious consequences for the structure and functioning of the terrestrial part of arctic ecosystems, due in part to changes in the arctic marine avifauna. Large colonies of plankton-eating little auks are located on mild mountain slopes, usually a few kilometres from the shore, whereas colonies of fish-eating guillemots are situated on rocky cliffs at the coast. The impact of guillemots on the terrestrial ecosystems is therefore much smaller than for little auks because of the rapid washing-out to sea of the guano deposited on the seabird cliffs. These characteristics of seabird nesting sites dramatically limit the range of occurrence of ornithogenic soils, and the accompanying flora and fauna, to locations where talus-breeding species occur. As a result of climate warming favoring the increase of ichthyofagous cliff-nesting seabirds, we can expect that large areas of ornithogenic tundra around the colonies of plankton-eating seabirds situated far from the sea may disappear, while areas of tundra in the vicinity of cliffs inhabited by fish-eating seabirds, with low total production and supporting few large herbivores, will likely increase, but only imperceptibly. This may lead to habitat fragmentation with negative consequences for populations of tundra-dependent birds and mammals, and the possibility of a substantial decrease in biodiversity of tundra plant and animal communities.

Notes: 6444

'File' Attachments: <internal-pdf://Stempniewicz-1212699136/Stempniewicz.pdf>

Language: English

Reference Type: Book

Record Number: 445

Author: L. Stempniewicz, Błachowiak-Samołyk, K. Węsławski, J. M

Year: 1996

Title: Birds of Kenya and northern Tanzania

City: Cape Town, South Africa

Publisher: Russel Friedman Books

Short Title: Birds of Kenya and northern Tanzania

Notes: 6445

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Book

Record Number: 447

Author: N. D. e. Burgess and G. Clarke, P. (eds)

Year: 2000

Title: The Coastal Forests of Eastern Africa

City: Cambridge

Publisher: IUCN,

Type of Work: Book

Short Title: The Coastal Forests of Eastern Africa

Keywords: Coastal Forests; Biodiversity; Endemic Species; ISW, East Africa

Abstract: Though tiny and fragmented, the forest remnants that make up the Coastal Forests of Eastern Africa contain remarkable levels of biodiversity. The 40,000 cultivated varieties of African violet, which form the basis of a US\$100 million global houseplant trade, are all derived from a handful of species found in the coastal Tanzanian and Kenyan forests. This hotspot is also home to a variety of primate species including three endemic and highly threatened monkey species and two endemic species of bushbabies. The Tana River, which runs through Central Kenya is home to two critically threatened and endemic primates, the Tana River red colobus and the Tana River mangabey. Agricultural expansion continues to be the biggest threat facing the Coastal Forests of East Africa. Due to poor soil quality and an increasing population trend, subsistence agriculture as well as commercial farming continue to consume more and more of the region's natural habitat.

Notes: 6447

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Conference Paper

Record Number: 448

Author: FAO

Year: 2005

Title: Status and trends in mangrove area extend worldwide. Forest Resource Division.

Conference Location: FAO, Rome

Publisher: FAO

Volume: 46

Type: Working paper

Pub Place: Kenya

Keywords: Coastal areas; mangrove areas; literature search; data; mangrove deforestation; aquaculture; environmental impact assessments; mangrove ecosystems.

Abstract: High population pressure in coastal areas has led to the conversion of many mangrove areas to other uses and numerous case studies describe mangrove losses over time. However, scarce information exists on the current status and trends in mangrove area extent at the global level. This document describes a recent initiative by the Food and Agriculture Organization of the United Nations (FAO) which aims at facilitating access to comprehensive information on the current and past extent of mangroves in all countries and areas in which they exist. This initiative builds on an earlier assessment by FAO/UNEP in 1980, the recent FAO Global Forest Resources Assessment 2000 (FRA 2000) and an extensive literature search. More than 2800 national and sub-national data sets have, so far, been collected, covering 121

countries and areas where mangroves are known to exist, with the earliest estimates dating back to 1918. An updated list of the most recent, reliable estimate for each country has been compiled. Regression analyses based on earlier data provided revised estimates for 1990 and 1980 and an extrapolated estimate for 2000 for each country. Changes in definitions and methodologies overtime make it difficult to compare results from different assessments and the extrapolation to 2000 was constrained by the lack of recent information from a number of countries. This estimate is thus indicative only and is likely to change when results from on-going and future assessments become available. The results of the present study suggest that the current mangrove area worldwide has now fallen below 15 million ha, down from 19.8 million ha in 1980. It also indicates that mangrove deforestation continues, albeit on a slightly lower rate in the 1990s (1.1 percent per annum) than in the 1980s (1.9 percent per annum), reflecting the fact that most countries have now banned the conversion of mangroves for aquaculture purposes and require environmental impact assessments prior to large-scale conversion of mangroves for other uses. The study concludes that better information on both the extent and the condition of mangroves is needed as an aid to policy and decision making aimed at the conservation, management and sustainable use of the world's remaining mangrove ecosystems.

Notes: 6448

URL: <http://www.fao.org/docrep/007/j1533e/J1533E02.htm#TopOfPage>

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Book

Record Number: 449

Author: GEF

Year: 2002

Title: Development and Protection of the Coastal and Marine Environment in Sub-Saharan Africa. Kenya National Report Phase 1: Integrated Problem Analysis.

Publisher: UNESCO

Number of Pages: 129

Type of Work: Book

Short Title: Development and Protection of the Coastal and Marine Environment in Sub-Saharan Africa. Kenya National Report Phase 1: Integrated Problem Analysis.

Keywords: Coastal Environment; Marine Environment; Integrated Coastal Management; Coastal Management; Africa

Abstract: In recognition of the fact that the social and economic welfare of the nations of sub-Saharan Africa require the sustainable development and adequate protection of coastal and marine resource bases, in 1998 two conferences were held which were merged into the African Process for the Development and Protection of the Coastal and Marine Environment in Sub-Saharan Africa. The objectives of the Pan African Conference on Sustainable Integrated Coastal Management (PACSIKOM) held in Maputo in July 1998 were further strengthened at the Cape Town Conference on Co-operation for Development and Protection of the Coastal and Marine Environment in Sub-Saharan Africa of December 1998. At this Conference the Cape Town Declaration was adopted which merged the Maputo and Cape Town conferences into one

single African Process, and set up an African Action Plan and African Strategy for the Development and Protection of the Coastal and Marine Environment in sub-Saharan Africa. Now termed the "African Process", it is based on national priorities and programmes, and also seeks to strengthen both the Nairobi and Abidjan Conventions. The Process recognises that many of the social, economic and environmental problems of the developing world are inseparably linked and are either transboundary in nature, or common to most countries. Therefore, regional co-operation and solidarity can help ensure lasting and effective solutions, and maximise limited resources. Since it was launched, the African Process has galvanised broad political support, in the understanding that regional co-operation and solidarity is required in order to develop effective and lasting solutions, and to maximise limited resources. Among the highlights that should be noted is the endorsement in July 1999 of the African Process by the Summit of the Organization for African Unity (OAU), and the decision by the OAU Summit of Lusaka, July 2001, to hold the Partnership Conference at the level of Heads of State in conjunction with World Summit on Sustainable Development (WSSD). In June 2002, the African Process was incorporated as the Coastal Management sub-theme of NEPAD's Environment Component in recognition of its substantive inputs to addressing priority problems in the coastal interface.

Notes: 6449

'File' Attachments:

internal-pdf://1-introduction-phase1-3543642880/1-introduction-phase1.pdf

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 450

Author: K. Kairu and N. e. Nyandwi

Year: 2000

Title: Guidelines for the study of shoreline change in the Western Indian Ocean region

Journal: UNESCO.

Volume: 40

Pages: 55

Type of Article: Journal

Short Title: Guidelines for the study of shoreline change in the Western Indian Ocean region

Legal Note: Kenya

Keywords: shoreline change; Beaches erosion; coastal erosion; coastal areas; sea level change; human activities; sediment discharge; coastal geology; ocean temperature; turbidity; coastal ecosystems; fringing reef shores; spatial and temporal scales ; Western Indian Ocean

Abstract: Physical shoreline change, including the erosion of beaches and coastal land and the accretion of sediment to form new land, is a natural phenomenon in the evolution of coastal areas. It follows the variations in relative sea level, climate and ecosystems that occur over a wide range of time-scales, from geological time to short-lived, extreme events. It may be exacerbated by human activities, either at the coast itself, e.g. by engineering works, or within the adjoining catchment, e.g. by river impoundment or changes in agricultural practice affecting freshwater and sediment discharge at the coast. The range of distinctive contemporary coastal

types within the Western Indian Ocean region reflects the considerable differences in coastal geology and sediment supply, in climate, in ocean temperature and turbidity, and, as a consequence of many of these factors, in the coastal ecosystems. There are, for example, rocky shores, low-lying sandy shores and fringing reef shores. Some coastal types, notably fringing reef shores, are made up of several different geomorphological components or facies, each representing a distinctive ecological habitat. Every type of shoreline is susceptible to change, but in different ways, at different rates, and with different socio-economic consequences. This manual covers the classification of the main coastal types of the region and the assessment of their susceptibility to contemporary physical change, in particular beach wasting and the marine erosion of coastal land. The formulation of management solutions that address the problems of shoreline change at the regional to site-specific scale demands reliable information on the factors responsible for such change. Knowledge both of the processes involved, and of the spatial and temporal scales over which those processes occur, is an essential prerequisite in the management process. The forcing processes may be due to extreme events, such as tropical cyclones leading to damaging tidal surge and severe wave conditions impacting the shore; or they may be of a long-term nature, such as a change in relative sea level. The impacts of natural forcing may be exacerbated by human activities or interventions, especially locally in the coastal zone, but also further afield in the catchments, e.g. modifying the discharge of sediment to the coast. The information gathered should aim at refining the likelihood of physical change occurring and recurring as well as providing an understanding of the processes involved.

Notes: 6450

Research Notes: IOC Manuals and Guides

'File' Attachments: <internal-pdf://121963E-0650783232/121963E.pdf>

Language: English

Reference Type: Journal Article

Record Number: 451

Author: D. Obura

Year: 2005

Title: Resilience and climate change: lessons from coral reefs and bleaching in the Western Indian Ocean

Journal: Est. Coast. Shelf Sci

Volume: 63

Issue: 3

Pages: 353–372

Type of Article: JOURNAL

Short Title: Estuarine, Coastal and Shelf Science

Legal Note: Kenya

Keywords: Mortality ; Stress ; Coral reefs ; Climatic changes ; Oceans ; Seawater ; Environmental protection ; Temperature ; Bleaching ; Temperature effects ; Mortality causes ; Temperature tolerance ; Zooxanthellae ; Ecosystem management ; Climate change ; Temperature trends ; Water temperatures

Abstract: The impact of climate change through thermal stress-related coral bleaching on coral reefs of the Western Indian Ocean has been well documented and is caused by rising sea water

temperatures associated with background warming trends and extreme climate events. Recent studies have identified a number of factors that may reduce the impact of coral bleaching and mortality at a reef or subreef level. However, there is little scientific consensus as yet, and it is unclear how well current science supports the immediate needs of management responses to climate change. This paper provides evidence from the Western Indian Ocean in support of recent hypotheses on coral and reef vulnerability to thermal stress that have been loosely termed 'resistance and resilience to bleaching'. The paper argues for a more explicit definition of terms, and identifies three concepts affecting coral-zooxanthellae holobiont and reef vulnerability to thermal stress previously termed 'resistance to bleaching': 'thermal protection', where some reefs are protected from the thermal conditions that induce bleaching and/or where local physical conditions reduce bleaching and mortality levels; 'thermal resistance', where individual corals bleach to differing degrees to the same thermal stress; and 'thermal tolerance', where individual corals suffer differing levels of mortality when exposed to the same thermal stress. 'Resilience to bleaching' is a special case of ecological resilience, where recovery following large-scale bleaching mortality varies according to ecological and other processes. These concepts apply across multiple levels of biological organization and temporal and spatial scales. Thermal resistance and tolerance are genetic properties and may interact with environmental protection properties resulting in phenotypic variation in bleaching and mortality of corals. The presence or absence of human threats and varying levels of reef management may alter the influence of the above factors, particularly through their impacts on resilience, offering the opportunity for management interventions to mitigate the impacts of thermal stress and recovery on coral reefs. These concepts are compiled within an overarching framework of spatial resilience theory. This provides a framework for developing linked scientific and management questions relating to the larger scale impacts of climate change on coral reefs, their management needs and prospects for their future.

Notes: 6451

'File' Attachments: <internal-pdf://Obura05-1232917761/Obura05.pdf>

Language: English

Reference Type: Journal Article

Record Number: 453

Author: N. H. Saji, B. N. Goswami, P. N. Vinayachandran and T. Yamagata

Year: 1999

Title: A dipole mode in the tropical Indian Ocean

Journal: Nature Publishing Group

Volume: 401

Pages: 360-363

Type of Article: Nature

Short Title: A dipole mode in the tropical Indian Ocean

Legal Note: Kenya

Keywords: Climatic changes

El Nino phenomena

Long-term records

Ocean-atmosphere system

Surface temperature
Teleconnections
Temperature anomalies
ISW, Indian Ocean

Abstract: For the tropical Pacific and Atlantic oceans, internal modes of variability that lead to climatic oscillations have been recognized, but in the Indian Ocean region a similar ocean–atmosphere interaction causing interannual climate variability has not yet been found. Here we report an analysis of observational data over the past 40 years, showing a dipole mode in the Indian Ocean: a pattern of internal variability with anomalously low sea surface temperatures off Sumatra and high sea surface temperatures in the western Indian Ocean, with accompanying wind and precipitation anomalies. The spatio-temporal links between sea surface temperatures and winds reveal a strong coupling through the precipitation field and ocean dynamics. This air–sea interaction process is unique and inherent in the Indian Ocean, and is shown to be independent of the El Niño/Southern Oscillation. The discovery of this dipole mode that accounts for about 12% of the sea surface temperature variability in the Indian Ocean—and, in its active years, also causes severe rainfall in eastern Africa and droughts in Indonesia—brightens the prospects for a long-term forecast of rainfall anomalies in the affected countries.

Notes: 6453

'File' Attachments: [internal-pdf://Saji\[1\]-0791073792/Saji\[1\].pdf](internal-pdf://Saji[1]-0791073792/Saji[1].pdf)

Author Address: Institute for Global Change Research, SEAVANS N 7F, 1-2-1 Shibaura, Minato-ku, Tokyo 105 6791, Japan

Language: English

Reference Type: Book

Record Number: 454

Author: UNEP

Year: 2006

Title: Africa Environment Outlook 2, our environment, our wealth.

City: Nairobi, Kenya.

Publisher: UNEP

Type of Work: Book

Short Title: Africa Environment Outlook 2, our environment, our wealth.

Keywords: Development projects; Environment management; Environmental protection; Natural resources; Nature conservation; Potential resources; Resource conservation; Resource development; Resource management; Sociological aspects; Africa

Abstract: The main focus of the AEO-2 report is on sustainable livelihoods and the environment. The report profiles Africa's environmental resources as assets for the continent's development. It highlights the potential of the region's natural resource base to support the development agenda of NEPAD and sustain human livelihoods. The report has five sections namely: Environment for Development, Environmental State-and-Trends: 20-Year Retrospective, Emerging Challenges, Outlook and Policy Recommendations.

Notes: 6454

'File' Attachments: <internal-pdf://Africa Environment Outlook 2-0148613376/Africa>

Environment Outlook 2.pdf

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 455

Author: C. Wilkinson, O. Linden, H. Cesar, G. Hodgson, J. Rubens and A. Strong

Year: 1999

Title: Ecological and socioeconomic impacts of 1998 coral mortality in the Indian Ocean: An ENSO impact and a warning of future change?

Journal: Ambio

Volume: 28

Pages: 188–196

Type of Article: AGORA

Short Title: Ecological and socioeconomic impacts of 1998 coral mortality in the Indian Ocean: An ENSO impact and a warning of future change?

Legal Note: Kenya

Keywords: Environmental aspects, El Nino, El Nino Current, Fish populations, Indian Ocean, Corals, Reefs

Abstract: The year 1998 was the warmest year since the recording of temperature 150 years ago. Furthermore, the 1990s have been the warmest decade ever recorded. The strongest El Nino was recorded in 1998. Consequently, high water temperatures were observed in the tropical Indian Ocean between 3 to 5 degrees above normal. As a result, many corals, reefs, and fish stocks in this region died.

Notes: 6455

Language: English

Reference Type: Book

Record Number: 456

Author: M. D. Spalding, Blasco, F. and Field, C.D., eds.

Year: 1997

Title: World Mangrove Atlas. The International Society for Mangrove Ecosystems,

Publisher: Okinawa, Japan

Pages: 178

Type of Work: Book

Short Title: World Mangrove Atlas. The International Society for Mangrove Ecosystems,

Keywords: Mangrove plants - Geographical distribution - Maps.; Mangrove plants.; Mangrove swamps - Maps.

Abstract: Maps prepared by the World Conservation Monitoring Centre; Funding by the International Tropical Timber Association. Includes bibliographies.

Notes: 6456

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Thesis

Record Number: 457

Author: J. Ochiwo

Year: 2004

Title: Sustainability of Marine Fisheries in Malindi-Ungwana Bay in Kenya.

Academic Department: M.A. Economics Dissertation submitted to Department of Economics

City: Nairobi.(Kenya)

University: University of Nairobi

Degree: M.A.

Short Title: Sustainability of Marine Fisheries in Malindi-Ungwana Bay in Kenya.

Keywords: Marine Fisheries; ISW, Kenya

Notes: 6457

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Journal Article

Record Number: 458

Author: J. Uku and M. Björk

Year: 2005

Title: Productivity aspects of three tropical seagrass species in areas of different nutrient levels in Kenya

Journal: Estuarine, Coastal and Shelf Science

Volume: 63

Issue: 3

Pages: 407-420

Date: May 2005

Type of Article: Journal Article

Short Title:

Legal Note: Kenya

Keywords: Seagrass; nutrient; productivity; growth; *Thalassodendron ciliatum*; *Thalassia hemprichii*; *Cymodocea rotundata*; Kenya

Abstract: Previous work conducted in two seagrass areas of different nutrient status, along the Kenyan coast, has shown that the seagrasses were characterised by differences in the species composition and biomass of epiphytic algae. This study was undertaken to evaluate the productivity patterns of the seagrass species growing in these same sites. Studies were made on *Thalassodendron ciliatum* (Forskål) den Hartog, *Thalassia hemprichii* (Ehrenberg) Aschers and *Cymodocea rotundata* Ehrenberg and Hempr. ex Ascherson growing in the lagoons of Nyali and Vipingo, along the Kenyan coast, during the South East (SE) and North East (NE) monsoon periods. The results of this study revealed differences in the levels of nitrate within the water column, with Vipingo having lower levels of around 4 µM during the low tide period of the SE monsoon while nitrate levels in Nyali reached levels of 16 µM during the same period. Of the three seagrass species studied, *C. rotundata* had the highest shoot densities in both sites. The shoot densities of *C. rotundata* reached levels of 1300 shoots m⁻² compared to an average of 600 shoots m⁻² for both *T. ciliatum* and *T. hemprichii*. The stems of *T. ciliatum* were found to

be 200 mm long in Nyali whereas those in Vipingo were 80 mm in length. Of the three seagrasses *T. ciliatum* and *T. hemprichii* showed significant differences in total leaf growth between the two sites. However, of these two species, only *T. hemprichii* showed distinct differences in leaf production and biomass when the two sites were compared. Leaves of *T. hemprichii* showed growth rates of 0.008 g dw shoot⁻¹ day⁻¹ in Nyali while the growth rate in Vipingo was 0.004 g dw shoot⁻¹ day⁻¹. Leaf production rates were approximately 0.005 g dw shoot⁻¹ day⁻¹ for *T. ciliatum* in both Nyali and Vipingo and that of *C. rotundata* was approximately 0.0015 g dw shoot⁻¹ day⁻¹ in the two sites. This suggests that of the three species studied, *T. hemprichii* may have been influenced by the nutrient input in Nyali. The abundance of epiphytes on the stems of *T. ciliatum* was higher in Nyali during both seasons; therefore we suggest that although the composition of epiphytic species is the main indicator of nutrient enrichment in these areas the enhanced productivity of *T. hemprichii* may be another indicator of the nutrient status of these study sites.

Notes: 6458

'File' Attachments: <internal-pdf://Uku-2250786560/Uku.pdf>

Language: English

Reference Type: Journal Article

Record Number: 460

Author: P. Flewelling, C. Cullinan, D. Balton, R. P. Sautter and J. E. Reynolds

Year: 2002

Title: Recent Trends in Monitoring, Control and Surveillance Systems for Capture Fisheries

Journal: FAO Fisheries Technical Paper

Volume: 415

Pages: 200p

Type of Article: Technical Paper

Short Title: Recent Trends in Monitoring, Control and Surveillance Systems for Capture Fisheries

Legal Note: Kenya

Keywords: A handbook for fisheries administrators for use when establishing or enhancing, monitoring, control and surveillance (MCS) systems in support of fisheries management initiatives

Abstract: The paper has been designed as a handbook for fisheries administrators for use when establishing or enhancing, monitoring, control and surveillance (MCS) systems in support of fisheries management initiatives. It updates the 1994 FAO Fisheries Technical Paper No. 338, An introduction to monitoring, control and surveillance systems for capture fisheries through a review of recent international fisheries agreements and new MCS approaches involving participatory management; preventive and deterrent MCS strategies; and the importance of safety-at-sea for fishers. The paper is divided into eight chapters to: 1) provide an overview of MCS; 2) review the legal basis for MCS activities; 3) propose design considerations for MCS systems; 4) review organizational considerations for MCS; 5) discuss management measures and consultation and planning issues; 6) review operational procedures and equipment; 7) review patrol, boarding, inspections and prosecution procedures; and

8) address emerging coastal MCS strategies. Annexes provide further details of operational issues and options for MCS system design and implementation.

Notes: 6460

URL: <ftp://ftp.fao.org/docrep/fao/005/y4411e/y4411e00.pdf>

'File' Attachments: <internal-pdf://y4411e00-3986616064/y4411e00.pdf>

Language: English

Reference Type: Report

Record Number: 461

Author: S. Ndegwa

Year: 2009

Title: Report on IOC-EU Delegation Evaluation of the IOC-EU Monitoring Control and Surveillance (MCS) Project

City: Mombasa

Institution: Ministry of Fisheries- Fisheries Department Coast and Marine

Type: Consultants report on the MCS capability of Kenya to participate in the IOC-EU MCS strategy

Short Title: Report on IOC-EU Delegation Evaluation of the IOC-EU Monitoring Control and Surveillance (MCS) Project

Keywords: A Draft Legal-Binding Instrument on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated fishing

Abstract: Although world fish stocks are dwindling and fisheries departments are struggling to design and enforce effective management systems, owners and operators of fishing vessels around the world take advantage of the lack of international legislation and effective enforcement to exploit stocks and push marine ecosystems beyond safe biological limits. Port state measures have been identified as a desirable and cost effective tool that will contribute to fisheries management and at the same time discourage illegal, unreported and unregulated fishing (IUU fishing). It also has practical linkages with other tools that combat IUU fishing, such as vessel monitoring systems (VMS) and trade measures. In the past decade, national, regional and international initiatives have focused on the adoption and implementation of increasingly stringent port State measures. This culminated in the negotiation of the legally binding Port State Agreement (PSA), hosted by the U.N. Food and Agriculture organization (FAO) in 2008 and 2009. The concept of port State control, as a means to deter IUU fishing, is a relatively recent concept in international fisheries law, although it is of course well established as a means of promoting compliance with international regulations concerning maritime transport (H. Hoppe, 2000). That it has not been more readily adopted in international fisheries law might appear somewhat surprising, given the obvious legal limitations of measures addressed to the flag state. Provisions concerning port State control have been adopted in many of the recent instruments developed in international fisheries law, but to date these have consisted mainly of rather general references to the concept, rather than setting out detailed measures. Relevant instruments have tended to focus on the role of the port States individually or through regional fishery bodies ("RFBs"), rather than through the mechanism of specific regional MOUs such as those developed for merchant ships. However, even with ongoing international cooperation, continuing challenges are emerging such as the need for

improved and harmonized port inspection procedures, improved information systems, improved coordination of catch and trade documentation and coordinated standards for vessel markings. There is also need for the development of technology-related requirements, such as regulations governing vessel monitoring systems (VMS).

Notes: 6461

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 462

Author: A. O. Tuda, L. D. Rodwell and T. Stevens

Year: 2007

Title: Conflict Management in the Mombasa Marine National Park and Reserve, Kenya: A spatial Multi Approach

Conference Name: Proceedings of the workshop on a regional perspective on MPAs in the Western Indian Ocean, Rodrigues Island, Mauritius

Conference Location: Newcastle

Publisher: University of Plymouth

Volume: MSc.

Pages: (ii + 131 pp.)

Type: MSc. Thesis

Pub Place: Kenya

Keywords: MPA planning, Resource-use conflicts, Multi-criteria analysis

Abstract: Marine Protected Areas (MPAs) that are designed to manage various uses of the marine ecosystems, in order to minimize their impact on environment as well as use conflicts, often fail to meet their objectives especially when their planning focuses more on meeting ecological targets to the exclusion of social aspects. This paper outlines an approach to Marine Protected Area (MPA) planning that incorporates conflict management objectives and ecological objectives within a decision-making framework. This approach is applied to the case of Mombasa Marine National Park and Reserve (MMNP&R) in Kenya. The approach primarily focuses on minimizing users conflicts

while staying focused on the main MPA purposes of conservation and sustainable use. Social and ecological criteria are identified and incorporated in a spatial multi-criteria decision analysis (SMCDA) framework to analyze incompatibilities between objectives.

The approach is applied in simulating the impacts of four MPA management scenarios, and analyzing interactions between the different stakeholder values, thus providing a basis for the predicting potential conflict. The results from the conflict analysis are integrated into a multiple-objective decision model to define an optimal spatial arrangement for the use of the MMNP&R that will maximize ecological gains and minimize stakeholders' conflicts.

Notes: 6462

'File' Attachments:

internal-pdf://Rodrigues_Workshop_Proceedings_low-res-2817668608/Rodrigues_Workshop_Proceedings_low-res.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 463

Author: S. Mangi

Year: 2007

Title: Successes and disappointments of MPAs in the Western Indian Ocean: the case of Mombasa Marine Park and Reserve

Conference Name: Proceedings of the workshop on a regional perspective on MPAs in the Western Indian Ocean, Rodrigues Island, Mauritius

Conference Location: Plymouth Marine Laboratory, Prospect Place, The Hoe, Plymouth PL1 3DH, United Kingdom,

Publisher: Newcastle University, Newcastle upon Tyne and Marine Education Trust, Cullompton, UK.

Pages: 41-49

Pub Place: Kenya

Keywords: MPAs

regulations

conservation

fisheries management

fish biomass

Abstract: Concerns about the effectiveness of marine protected areas (MPA) as conservation and fisheries management tools have led to a growing interest in conducting evaluations. Protection from fishing leads to increases in biomass, abundance and average size of exploited species and to increased diversity. Such effects are of great interest to fisheries managers because rebuilding exploited populations in marine parks offers prospects of fisheries enhancement. This paper reviews the conservation and fisheries management issues surrounding the Mombasa Marine Park and Reserve. Since effective protection, the park has seen increases in live coral cover while sea urchin populations have gradually decreased. Both fish biomass and density have dramatically increased overtime and there is evidence that this has enhanced the adjacent fisheries. Gear restrictions in the surrounding reserve would have been more effective if the regulations were well enforced. For instance, beach seines are banned but seining still continues despite growing evidence that this gear is greatly impacting coral reef biodiversity. The management issues surrounding the park therefore include the enforcement of MPA regulations and mechanisms for raising education and awareness of conservation among stakeholders. Nevertheless, the park's establishment has helped restore coral reef habitats and enhance adjacent fisheries yields. The lessons learned concerning the process of the MPA establishment should form the basis for solutions regarding compliance of regulations.

Notes: 6463

URL: www.wio-compas.org/files/Rodrigues_Workshop_Proceedings_low-res.pdf

'File' Attachments:

internal-pdf://Rodrigues_Workshop_Proceedings_low-res-2568600832/Rodrigues_Workshop_

Proceedings_low-res.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Magazine Article

Record Number: 465

Author: D. O. Obura and J. M. Mwaura

Year: 2001

Title: Overlap of tourism and fisheries sites in the Diani-Chale coral reef. Opportunities for multiple use Zonation.

Magazine: CORDIO-EA

Place Published: Mombasa

Publisher: Coral reef degradation in the Indian Ocean.

Pages: 10 pp

Short Title: Overlap of tourism and fisheries sites in the Diani-Chale coral reef. Opportunities for multiple use Zonation.

Keywords: Tourism, fisheries, coral reef

Abstract: Mapping the use and activity pattern of coral reef resource users can contribute to management of multiple uses. This study examined site use by local fishermen and tourism operators, in Diani-Chale reef system. The study area is characterized by an active tourism industry and small scale indigenous fishing communities, in growing conflict over use of reef sites. The two primary issues were; conflict over extraction versus conservation, and beach and reef access determined by land ownership.

Mapping was conducted using handheld GPS, digitized maps and field surveys. Local site names and information were gathered through informal interviews and participant observation, accompanying boat operators and local fishers during their daily activities on the reef.

The following deductions were made: fishing was a more dispersed activity than tourism on the coral reef, earning lower levels of income for a greater population of users. Tourism use was focused at key sites were fewer in number and had a particular combination of attractive feature. The surrounding seascape was used for transport or scenery, but not as a primary source.

It was suggested that adopting a fishing-centered context for approaching management of the whole reef area, with individual sites identified as the key locations for negotiating compromise was necessary to enable tourism (and other uses) in the broader context of fishing. Focussing management attention towards the small site level at which resource use operated might help in dealing with some of the so far intractable problems in coral reef management in Kenya.

Notes: 6465

'File' Attachments: internal-pdf://Obura_mwaura[1]-0436567808/Obura_mwaura[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 466

Author: T. R. McClanahan

Year: 1994

Title: Kenya coral reef lagoon fish: effects of fishing, substrate complexity, and sea urchins.
Coral reefs

Journal: Coral Reefs

Volume: 13:

Pages: 231-241

Short Title: Kenya coral reef lagoon fish: effects of fishing, substrate complexity, and sea urchins. Coral reefs

Legal Note: Kenya

Keywords: coral reef lagoon fish, harvesting, surgeonfish, triggerfish, butterflyfish, angelfish, parrotfish, Malindi, Watamu and Kisite MNP, Diani, Vipingo, Kanamai, Raslwatine

Abstract: Population density, number of species, diversity and species-area relationships of fish species in eight common reef-associated families were studied in three marine parks receiving total protection from fishing (Malindi, Watamu, Kisite Marine National Parks), four sites with unregulated fishing (Diani, Vipingo, Kanamai, Raslwatine), and one reef which recently received protection from fishing (Mombasa MNP). Data on coral cover, reef topographic complexity, and sea urchin abundance were collected and correlated with fish abundance and species richness. The most striking result of this survey was a consistent and large reduction in the population density and species richness of 5 families (surgeonfish, triggerfish, butterflyfish, angelfish and parrotfish). Sea urchin abundance was negatively associated with numbers of fish and fish species but the interrelationship between sea urchin, substrate complexity, coral cover and management made it difficult to attribute a set percent of variance to each factor-although fishing versus no fishing appears to be the strongest variable in predicting numbers of individuals and species of fish, and their community similarity. Localized species extirpation was evident for many species on fished reefs (for the sampled area of 1.0 ha). Fifty-two of 110 species found on protected reefs were not found on unprotected reefs.

Notes: 6466

'File' Attachments: <internal-pdf://McClanahan231-0191403009/McClanahan231.pdf>

Language: English

Reference Type: Report

Record Number: 467

Author: J. E. Cinner and T. R. McClanahan

Year: 2006

Title: A baseline socioeconomic assessment of fishing communities along the North Coast of Kenya. Final Report

Institution: WIOMSA – Marine Science for Management Program

Pages: 28pp

Publisher: WIOMSA

Short Title: A baseline socioeconomic assessment of fishing communities along the North Coast of Kenya. Final Report

Keywords: Household economics, dependence, marine resource use, fishing pressure,

community-based marine protected area

Abstract: A socio-economic assessment was conducted within the North Coast of Kenya to identify key socio-economic factors affecting inshore coral reef fisheries. The study focused on nine communities: Bamburi, Kuruwitu/Shariana, Mayungu, Mijikenda, Shela, Takaungu, Vipingo, and Vuma/Kayanda. Socio-economic information was gathered using several techniques, including household surveys, resource user key informant interviews, community leader key informant interviews, and oral histories. Informants were asked about aspects of household economics, dependence and perceptions of marine resource use, management, and governance. Communities varied considerably in regards to their dependence on marine resources. Smaller communities such as Mayungu and Mijikenda had greater than 60 and 90 percent of households engaged in the fishery, respectively. However, the proportion of fishers was relatively small in the areas close to Mombasa (Bamburi and Utange). Households that fished generally ranked fishing as their most important occupation. We found extremely high fishing pressure per km² of shallow water fishing grounds in Takaungu and Vipingo, primarily due to small fishing grounds. There is a clear need to develop regulations that will limit the effect of this intensive fishing effort at these sites. The mean size of fish landed was particularly low at Vipingo (<12cm) and Marina (13cm). There was an array of marine resource governance structures either instituted or in development at the study sites. The Bamburi beach and Marina sites bordered the Mombasa marine park and the Mayungu and Shela sites bordered the Malindi marine park. Fishers from Mijikenda also fished adjacent to the Malindi marine park. Vipingo and Kuruwitu had the highest level of appreciation of closed areas and are attempting to establish a community-based marine protected area. Despite legal prohibitions, a large proportion of fishers at both Marina and Mijikenda engaged in destructive fishing methods, particularly beach seining. There is poor understanding of the factors that influences fisheries and means to improve them and the marine environment.

Notes: 6467

URL: <http://www.wiomsa.org/filearchive/5/511/KenyaSocioEcon2006.pdf>

'File' Attachments: <internal-pdf://KenyaSocioEcon2006-1719313664/KenyaSocioEcon2006.pdf>

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Conference Paper

Record Number: 468

Author: M. Nyawira

Year: 2003

Title: Enforcement in Kenya's Marine Protected Area Network in Second International Tropical Marine Ecosystems Management Symposium (ITMEMS), Manila Philippines -Theme 12

Conference Name: Second International Tropical Marine Ecosystems Management Symposium (ITMEMS)

Conference Location: WCS/ http://www.itmems.org/itmems2/it2_Th12.html

Publisher: International Tropical Marine Ecosystems Management Symposium (ITMEMS)

Pages: 7pp

Type: Workshop report

Pub Place: Kenya

Keywords: Enforcement, marine pncerotected areas, complia

Abstract: This paper looked at the enforcement in marine protected networks from institutional arrangements and enforcement mechanisms. The level of compliance in regulations governing the marine protected areas was also analysed.

Notes: 6468

URL: http://www.itmems.org/itmems2/it2_Th12.html

'File' Attachments: internal-pdf://T12_Nmuthiga[1]-0761306881/T12_Nmuthiga[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 469

Author: T. R. McClanahan and S. Mangi

Year: 2000

Title: Spillover of exploitable fishes from a marine park and its effects on the adjacent fishery

Journal: Ecological society of America (ESA)

Volume: 10 (6):

Pages: 1792- 1805

Short Title: Spillover of exploitable fishes from a marine park and its effects on the adjacent fishery

Legal Note: Kenya

Keywords: adaptive management, emigration rates fishing, herbivory, integrated coastal area management, lethrinidae, siganidae, acanthuridae

Abstract: The role of a Marine Protected Area in enhancing local fisheries, through the emigration or spillover of exploitable fishes, was studied in Mombasa Marine Park, Kenya, over a seven-year period during a time when the park's border changed and pull seines were eliminated. Catches were measured before and after the park's establishment and during the management changes and these catches were compared with the unmanaged side of the park. Additionally, baited

traps were placed on both sides of the park over a full tidal cycle, which allowed measurement of the spillover from the park compared to the deeper, rougher, and less fished reef edge. The total wet mass of catches per trap, the mean size of the trapped fish, and the number of fish species caught per trap declined as a function of the distance away from the park edge on both the southern and northern sides. However, this relationship was truncated on the unmanaged side, which also had smaller catches, smaller fish, and fewer species than the managed side. Trap fishers on the managed side adapted to the spillover by increasing the traps per fisher, which had the effect of reducing the catch per trap. Tides and reef morphology also appeared to interact and influenced catches, but no relationships were found between catches and benthic substratum cover, which was usually dominated by seagrass and sand. Spillover from the deeper reef edge was evident for the managed but not the unmanaged side of the park, but may be due to differences in reef morphology interacting with tidal patterns rather than management. On the managed side, the park significantly increased the catch per fisher and catch per area by 50%, but even after the park's size was reduced, the total catch was reduced

by 30%. The reduced park was still 50% of the total area. Consequently, the catch per area increase was insufficient to compensate for the lost area over this early period of the park's establishment. Spillover was greatest for the dominant fisheries species: (Siganidae; herbivores), emperors (Lethrinidae; carnivores), and surgeonfish (Acanthuridae; herbivores) families, which had instantaneous emigration rates from the park to the reserve fishing ground of 0.5. The field survey, combined with previous modeling studies, based on adult emigration rates from marine reserves, suggested that tropical fisheries dominated by rabbitfish, emperors, and surgeonfish should be enhanced by closed areas of 10–15% of the total area. The optimal protected area might increase if larval export was important, but the predicted response should not be measurable for 10 years, beyond the length of the study, as breeding stock developed inside protected areas.

Notes: 6469

'File' Attachments:

internal-pdf://McClanahan_Mangi_01-2853792768/McClanahan_Mangi_01.pdf

Language: English

Reference Type: Report

Record Number: 470

Author: D. Malleret-King

Year: 2003

Title: Food Security benefits of the Kisite Marine national park for the surrounding fishing communities In

City: Leiden-Netherlands

Institution: African Studies centre

Volume: 70/2003

Pages: 201-214

Type: Research Report 70/2003

Short Title: Food Security benefits of the Kisite Marine national park for the surrounding fishing communities In

Keywords: Marine protected area, food security, Kisite –Mpunguti

Abstract: This paper aims at investigating if and how Marine Protected Areas (MPA) benefits the surrounding communities. The food security status of five fishing communities surrounding the Kisite Marine National Park on the south coast of Kenya was examined. The underlying assumption was that if MPAs benefit the surrounding fisheries, it would show in the socio-economic status of the fishing communities.

Effects of the presence of the park were detected in several ways. First, it was found that house-holds depending for their livelihoods on tourism around the parks were more food secure than the others. Secondly, it was established that the economic structure of the communities was affected by the distance of the communities from the main tour operators linked to the park. Finally the households fishing nearer the protected reefs were found to be more food secure than the others. However, these benefits of the park are constrained by the distance of communities from the park.

Notes: 6470

'File' Attachments: internal-pdf://ASC-1253933-067[1]-0568847360/ASC-1253933-067[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 472

Author: N. Muthiga, A. Costa, H. Scotta, C. Muhando, R. Mwaipopo and M. I. W. Schleyer, C. (ed.)

Year: 2008

Title: Status of coral Reefs in East Africa: Kenya, Tanzania, Mozambique and South Africa

Series Editor: C. E. S. o. C. R. o. t. W. In Wilkinson

Institution: Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre

Volume: (6)

Pages: 91-118

Short Title: Status of coral Reefs in East Africa: Kenya, Tanzania, Mozambique and South Africa

Keywords: GCRMN, coral reef monitoring, management, status reports

Abstract: This Status of Coral Reefs of the World: 2008 report is the 5th global report since the GCRMN (Global Coral Reef Monitoring Network), was formed in 1996 as an operational network of the International Coral Reef Initiative (ICRI). The catalyst for GCRMN was the inability of international agencies to report objectively on the health or otherwise of the world's coral reefs. Many Reefs in East Africa, have shown good recovery after the massive losses in 1998 but recovery was slowed on other reefs by fishing and other ecological factors, including COTS infestations. The management of coral reefs is improving with more MPAs and increased management effectiveness; and the number of non- traditional forms of MPAs, including community managed areas, are increasing. However, there is a need for increased enforcement of existing fisheries , MPA and coastal development regulations. There is also greater need for socio-economic monitoring to assist in increasing support to address livelihoods, increased support for research and monitoring programs and the strengthening of national programs that address management in an integrated manner.

Notes: 6472

URL: http://www.reefbase.org/resource_center/publication/statusreport

'File' Attachments: internal-pdf://East Africa-1743960832/East Africa.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 473

Author: A. King

Year: 2003

Title: Strategies Used by Local Fishers to Ensure Access to and Control Over Scarce Resources in Galu and the Wider Implications for Marine Resource Management

Book Title: Recent Advances in Coastal Ecology; Studies from Kenya

City: Leiden – Netherlands

Publisher: African Studies Centre- Netherlands

Number of Volumes: 70

Pages: 215-232

Series Editor: A. S. C.-. Netherlands

Edition: In Jan Hoorweg and Nyawira Muthiga (eds)

Short Title: Strategies Used by Local Fishers to Ensure Access to and Control Over Scarce Resources in Galu and the Wider Implications for Marine Resource Management

Section: Kenya

Keywords: Livelihoods, Socio economic, Fisheries, Marine resource , management

Abstract: An analysis of livelihoods and production systems in the community of Biga, Galu sub-location, showed that there was a high degree of socio-economic differentiation within the community. Differences related to production methods. These included different fishing methods, land use activities or different combination of the above.

The process by which fishers tackle problems of resource access and control were investigated for the three situations: the attempted implementation of the Diani-Chale marine reserve; the grabbing of Trust land earmarked for fisheries community use at Mwape; conflict between local Digo fishers and migrant Wapemba fishers. Using social network analysis the importance of different actors (groups, individuals, and organizations) in solving the fishers' problems was determined. The results showed that some unexpected actors, such as those without natural resource management remit, were very important in the process. The social network analysis also showed that although people's resource access and control are shaped by many interacting institutions, ad hoc processes, where people simply seek whatever path is necessary to solve their problems, also play an important role.

The wider implications for marine resource management relate to creating socio-political and institutional environments that enable problems to be solved. Discussions includes the need to have a better understanding of what is going on on the local level, both in terms of livelihoods and institutional arrangements. It also questions the validity and effectiveness of current over structured approaches to management that impinge on peoples' safeguard their food security.

Notes: 6473

'File' Attachments: [internal-pdf://ASC-1253933-067\[1\]-3545677568/ASC-1253933-067\[1\].pdf](internal-pdf://ASC-1253933-067[1]-3545677568/ASC-1253933-067[1].pdf)

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 475

Author: T. R. McClanahan and N. A. J. Graham

Year: 2005

Title: Recovery trajectories of coral reef fish assemblages within Kenyan marine protected areas

Journal: Marine Ecology Progress Series

Volume: 294

Pages: 241–248

Type of Article: Journal Article

Short Title: Recovery trajectories of coral reef fish assemblages within Kenyan marine protected areas

Alternate Journal: Inter-Research, Oldendorf

Legal Note: Kenya

Keywords: Biomass , Recovery , Marine protected areas , Calcifying algae , Fish growth, Size spectra

Abstract: The size, density and biomass of coral reef fish in 4 fully closed marine protected areas (MPAs) with different ages were studied over a 17 yr period. Space-for-time substitution samples were available for a period of 4 yr before, and 36 yr after the closure. Both the height of the size structure graph (which is a value of overall abundance–biomass) and the assemblage biomass graph are convex polynomials with a maximum biomass of 1200 kg ha⁻¹ at 22 yr. This suggests that full recovery of coral reef fish assemblages in terms of abundance–biomass is considerably longer than generally believed. Beyond 25 yr, there can be a small loss in biomass, which we suggest is due to reduced net primary production associated with the increased abundance of calcifying algae attributable to intense grazing. Size spectra slopes were variable at all times, changed quickly, and were probably influenced by local environmental conditions, which made concise predictions for equilibrium coral reef size structure rather difficult.

Notes: 6475

URL: <http://www.int-res.com/articles/meps2005/294>

'File' Attachments: <internal-pdf://McClanahan-2005-2786356736/McClanahan-2005.pdf>

Language: English

Reference Type: Journal Article

Record Number: 476

Author: T. R. McClanahan, S. Mwanguni and N. A. Muthiga

Year: 2005

Title: Management of the Kenyan coast

Journal: Ocean & Coastal Management

Volume: 48

Issue: 11-12

Pages: 901–931

Short Title: Management of the Kenyan coast

Legal Note: Kenya

Keywords: ICM, traditional management, integration, stakeholders

Abstract: We describe the changes in the management of marine resources in Kenya from traditional management, through the era of marine protected areas and the fisheries sector, towards the initial developments of an integrated coastal area management system, which has only been active since the early 1990s. The first meetings between sectors were held in the mid-1990s where the responsibilities of management were agreed upon and from which a number of memorandums were initiated as part of the integrative process that was lead by the Coast Development Authority. Two integrated coastal management (ICM) pilot projects started in the mid- to late 1990s were undertaken to test the effectiveness of the process in two tourist beaches north of Mombasa and later Diani. These ICM programs primarily focused on infrastructural development and resource access issues and participants needed to be reminded that that the objectives of the ICM process were to improve natural resource management and protect biodiversity. There was also the problem that government and the larger economic interests were involved in policy and planning but the poor and associated

communities were often marginalized because they lacked effective formal organizations and finances to represent them. The financial support for projects prior to 2003 was generally less than US \$150 000 and this and the poverty of the institutions and difficulties of establishing financial sustainability limited the programs and their problem solving. Nonetheless, there has been sustained progress and lessons learned concerning interactions with stakeholders, zoning of activities, linkages among groups, and improvements in the environment that should form the basis for further integration and solutions.

Notes: 6476

'File' Attachments: <internal-pdf://McClanahan05-0498083328/McClanahan05.pdf>

Language: English

Reference Type: Journal Article

Record Number: 477

Author: T. R. McClanahan, E. Verheij and J. Maina

Year: 2006

Title: Comparing the management effectiveness of a marine park and a multiple-use collaborative fisheries management area in East Africa

Journal: Aquatic Conservation: Marine and Freshwater Ecosystems

Volume: 16

Issue: 2

Pages: 147–165

Short Title: Comparing the management effectiveness of a marine park and a multiple-use collaborative fisheries management area in East Africa

Alternate Journal: John Wiley & Sons, Ltd.

Legal Note: Kenya

Keywords: biodiversity; climate disturbances; closed-area management; collaborative management; fisheries management; international boundaries; Kenya; management effectiveness; Tanzania

Abstract: The coral reefs across the international border between Kenya and Tanzania, where historical differences in government policy and socio-economic conditions created two different management systems, were examined: a large permanent closed area and a collaborative fisheries management project that used gear management and small voluntarily and temporary closed areas, respectively. The diversity and ecology of the reefs in these two management systems were compared spanning a seven-year period to evaluate the effectiveness of the management and to assess the ecological response to a large-scale water-temperature anomaly in 1998. 2. Comparisons of rates of predation on sea urchins and of herbivory, using a seagrass assay, were made along with measures of benthic cover and fish abundance and diversity. 3. The collaborative fisheries management system was successful in increasing fish stocks, reducing erect algae, and maintaining ecological diversity and stability across the thermal anomaly. This management system, however, was not successful in protecting the expected full biodiversity of fish, predation rates on sea urchins, or the sensitive, branching coral species. Management of the fishery also increased fish stocks in the adjacent, large, permanently closed area, compared to Kenyan parks without this management. 4. The large, permanently closed area in the other system maintained high diversity, high predation

rates on sea urchins and high herbivory rates, which maintained erect algae abundance and diversity at low levels. The temperature anomaly was destructive to a number of the dominant delicate branching coral species, but overall coral cover and diversity were maintained, although dominance switched from branching *Porites* spp. to *Seriatopora* spp. over this period. The large closed area system protected the undisturbed ecology of these reefs and associated ecological processes, and the full diversity of fish and coral, including sensitive species such as branching corals and slow-growing fish. 5. Collaborative fisheries and large permanent closed area management have different attributes that, when combined, should achieve the multiple purposes of sustainable fisheries, ecosystem functions and protection of fishing-sensitive species.

Notes: 6477

'File' Attachments: internal-pdf://McClanahan, TR4-1558897920/McClanahan, TR4.pdf

Language: English

Reference Type: Report

Record Number: 478

Author: N. A. Muthiga

Year: 2006

Title: Assessing the effectiveness of management of marine protected areas in Kenya: Experiences from the Mombasa marine park and reserve

City: Mombasa

Institution: Proceedings of 10th International Coral Reef Symposium

Pages: 1231-1242

Publisher: WCS

Type: Workshop report

Short Title: Assessing the effectiveness of management of marine protected areas in Kenya: Experiences from the Mombasa marine park and reserve

Keywords: Workshop report

Abstract: Marine protected areas (MPAs) are reported to be effective means of managing coral reefs; consequently, many developing countries have established MPA programs. However, whether these MPAs are successful measured against their stated objectives has rarely been assessed. An assessment of the management effectiveness of Kenya's youngest MPA, the Mombasa Marine National park and reserve, was conducted using biophysical, socio-economic and governance indicators including coral reef health, socioeconomic welfare and participation of stakeholders and the level of institutional support for the management of the MPA. Rates of recovery of coral cover and finfish biomass were higher in the marine park (no-take area) than in the marine reserve (restricted fishing zone) indicating that the marine park is making some progress towards meeting the stated objective of biodiversity conservation. The marine reserve however, is not as effective in meeting the objective of sustainable utilization, because both coral cover and finfish biomass have not shown any appreciable increase after protection. The MPA and local communities are highly dependent on tourism and their financial stability was negatively impacted by factors external to the management of the MPA including ethnic violence and international terrorism. In addition the 1998 bleaching event caused high mortality of corals in the MPA; while the park is showing signs of recovery the reserve is not.

Finfish biomass did not show marked changes after the bleaching. The MPA is adequately supported with national legislation, financial support and a management plan. However administrative instability within the management authority (the Kenya Wildlife Service) and conflicts of mandate with other national institutions such as Fisheries department has constrained the ability of the MPA to implement management initiatives.

Notes: 6478

'File' Attachments: internal-pdf://Muthiga_NA[1]-0154204673/Muthiga_NA[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 479

Author: N. A. Muthiga, J. A. Kawaka and S. Ndirangu

Year: 2009

Title: Evaluating the effectiveness of management of the Malindi–Watamu marine protected area complex in Kenya

Journal: Ocean & Coastal Management

Volume: 52

Issue: 8

Pages: 417–423

Short Title: Evaluating the effectiveness of management of the Malindi–Watamu marine protected area complex in Kenya

Legal Note: Kenya

Keywords: Management effectiveness, marine parks, biodiversity conservation, indicators, coral reefs

Abstract: An assessment of management effectiveness of Kenya's oldest marine protected areas (Malindi and Watamu) was conducted within the framework of a regional assessment in Kenya, Seychelles and Tanzania. Biophysical, socio-economic and governance indicators were used to assess the delivery of MPA management objectives. Results indicate that the Malindi and Watamu marine parks that are no-take areas are making progress towards meeting their stated objective of biodiversity conservation. The 1997–1998 ENSO related bleaching event caused the greatest single measurable impact on the coral reefs of the marine parks leading to very high levels of coral mortality. The marine reserve where fishing is regulated was less effective in meeting its objective of sustaining community livelihoods. The weakest trends were related to the development of governance structures. A combination of management inefficiencies due to overlapping mandates, financial and administrative constraints, and inadequate stakeholder participation interacted to reduce the ability of the MPAs to fully achieve their objectives

Notes: 6479

'File' Attachments: internal-pdf://Muthiga09-2444304128/Muthiga09.pdf

Language: English

Reference Type: Book

Record Number: 481

Author: I. Ngugi

Year: 2002

Title: Economic Impacts of Marine Protected Areas: A Case Study of The Mombasa Marine Park (Kenya)

Series Title: Marine Science Development in Tanzania and Eastern Africa WIOMSA Book Series No 1

City: Zanzibar, Tanzania

Publisher: Richmond and Francis Editors, Zanzibar, Tanzania

Number of Pages: 11pp

Short Title: Economic Impacts of Marine Protected Areas: A Case Study of The Mombasa Marine Park (Kenya)

Keywords: Conservation, Marine park, attitude, conflicts, management approach

Abstract: The conservation of the marine environment is an integral part of the broader initiatives of environmental conservation in Kenya. A major motivation for the delineation of Marine Protected Areas (MPAs) in Kenya has been the promotion of tourism and also the need to conserve marine bio-diversity for use by posterity. However, the conservation of marine resources in Kenya has led to certain resource use conflicts between national conservation agencies like the Kenya Wildlife Service and local communities. The study reported in this paper sought to examine the economic implications of the Mombasa Marine Park on a local fishing community, and thus provide an insight into the factors that lead to such conflicts. In the study, catch related variables pertaining to the marine protected area are found to be significant. At the same time, attitude of local fishermen towards the establishment of the parks is found to be extremely negative. The reasons for this included park establishment procedures as well as the lack of alternative sources of income for the communities displaced from the area now managed as a park. This paper recommends that in establishing an MPA in a developing and demographically dynamic country like Kenya, conservation authorities should be well aware of and integrate existing traditional systems of resource's use into modern management practice. This may be achieved through a multi-disciplinary approach to the varied issues related to the establishment and management of MPAs. This approach should build the capacity for active management of any conflict related to the use of resources that may arise.

Notes: 6481

'File' Attachments:

internal-pdf://Economic_impacts_of_marine_protected_areas[1]-1845783040/Economic_impacts_of_marine_protected_areas[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 482

Author: J. G. Tunje and J. Hoorweg

Year: 2003

Title: Awareness of Resources Degradation among Artisanal Fishers in Kilifi and Lamu In Recent Advances in Coastal Ecology; Studies from Kenya

Book Title: Recent Advances in Coastal Ecology; Studies from Kenya

City: Leiden – Netherlands

Publisher: African Studies Centre University of Leiden / Moi University, WCS

Number of Volumes: 70/2003

Series Volume: 70/2003

Pages: 185-200

Series Editor: A. S. C.-. Netherlands

Edition: In J Hoorweg and N Muthiga (eds)

Short Title: Awareness of Resources Degradation among Artisanal Fishers in Kilifi and Lamu In Recent Advances in Coastal Ecology; Studies from Kenya

Section: Kenya

Keywords: Environmental conservation, income, perceptions, awareness

Abstract: This study was carried out in Kilifi (including Malindi) and Lamu Districts of Kenya, focusing on the activities of artisanal fishermen. The fishing methods that the fishermen use and the extent they contribute to coral reef degradation were the major study objective. The fishing methods used, factors for their choice, and their perceived impacts on coral reefs were investigated. Indigenous environmental conservation efforts, fishermen's alternative sources of income, and attitudes towards environmental conservation were also examined.

Fishermen mainly use the gear they have experience with and gear that bring them high catches. They did not consider the environmental impacts of the gear they used. The results also revealed that there were few signs of indigenous marine conservation in this part of the coast. Half of the fishermen interviewed observed certain cultural restrictions relating to personal safety at work, good hygiene and fish handling. The other half did not. Finally, local fishermen are willing to initiate and participate in programmes of marine environmental conservation aimed at the fishery resource as long as it enables them to improve their incomes.

Notes: 6482

'File' Attachments: [internal-pdf://ASC-1253933-067\[1\]-4099292928/ASC-1253933-067\[1\].pdf](internal-pdf://ASC-1253933-067[1]-4099292928/ASC-1253933-067[1].pdf)

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book Section

Record Number: 483

Author: T. M. Munyao, M. P. Tole and P. D. I. J. H. a. N. M. e. Jungerius

Year: 2003

Title: Sabaki River Sediment Transport and Deposition in the Indian Ocean In Recent Advances in Coastal Ecology; Studies from Kenya

Book Title: Recent advances in coastal ecology

City: Leiden – Netherlands

Publisher: African Studies Centre- Netherlands

Pages: 119-132

Series Editor: W. African Studies Centre University of Leiden / Moi University

Short Title: Sabaki River Sediment Transport and Deposition in the Indian Ocean In Recent Advances in Coastal Ecology; Studies from Kenya

Section: Kenya

Keywords: Suspended solids, sediments, discharge, continental shelf

Abstract: The study aimed at investigating transport and deposition of sediments discharged by the Sabaki River into the Indian Ocean. Suspended solids, bottom sediment grain size distribution and mineralogy, and seasonal discharge rates were measured. The Sabaki River discharges 1.18×10^6 to 2.47×10^7 tons of sediments per annum. The highest sediments discharge occurs during the N.E monsoon period, attaining a range 2.96×10^5 to 1.70×10^7 tons, while the lowest discharge occurs during the S.E- N.E monsoons periods, attaining a range of 1.11×10^5 to 2.27×10^5 tons. Sediments in the study area are moderately well to very well sorted. Grain size decreases both across and along shore and ranges from medium to very fine. During the study period, Malindi- Mambui beach experienced net sediment gain as most heavy sediment grains from the river mouth were deposited along the beach and inter-tidal zone. The plume total suspended solids facilitates along-shore transport more than across shore transport, and travels beyond the North and South limits of the study area at solids concentration levels of 0.010 to 500g/l and 0.010 to 0.900g/l respectively. The plume moves both to the north and south of Sabaki River mouth, depending on the monsoon direction. Generally, Total suspended solids levels decreased both along and across shore. The lowest mean value of suspended solids was 0.010g/l, while the highest mean value was 1.85g/l. Deposition of silty sediment occurred from mid-continental shelf seaward.

Notes: 6483

'File' Attachments: internal-pdf://ASC-1253933-067[1]-2905180417/ASC-1253933-067[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 484

Author: S. Nzuki

Year: 2005

Title: Enhancing the Conservation and Management of Sea Turtles in Kenya

City: Mombasa

Institution: Kenya Sea Turtle Conservation Committee/Envasses Environmental Consultants

Publisher: K. S. T. C. C. E. E. Consultants

Short Title: Enhancing the Conservation and Management of Sea Turtles in Kenya

Keywords: Sea turtles, nesting sites, coastal development, participatory rural appraisal, community involvement

Abstract: This is a technical report prepared on the conservation and management of sea turtles in Kenya following a two year funding intervention from the UNDP/GEF/SGP. It focuses on the results of undertaking monitoring of sea turtle nesting sites along the entire Kenyan coast, fisheries interactions with marine turtles, coastal development and its impact on sea turtle nesting site fidelity and education and awareness programmes targeting local communities. Participatory Rural Appraisal (PRA) approaches were further used to obtain historical perceptions and trends in marine resources in using sea turtles as a flagship. Degradation of marine resources was identified to occur at a rate of between 30-80% in areas along the Kenyan coast using 1960 as a base year for the retrogression estimates.

Notes: 6484

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 486

Author: J. Tychsen

Year: 2006

Title: KenSea: Environmental Sensitivity Atlas for Coastal Area of Kenya

City: Copenhagen-Denmark

Institution: Geological Survey of Denmark and Greenland: Ministry of the Environment, Oester Voldgade, Copenhagen-Denmark

Publisher: G. S. o. D. a. Greenland

Type: Report

Short Title: KenSea: Environmental Sensitivity Atlas for Coastal Area of Kenya

Keywords: Environmental, Sensitivity

Abstract: The problem of oil spill response can be complex if a decision has to be made in short timelines of less than one day as is often the case. The knowledge of the spread and distribution of natural resources along the Kenyan coast would be quite challenging to a command center grappling with operational and political pressure from various sectarian interests all seeking satisfactory response during a spill incidence. In order to arrive at objective compromise decision, information must be available in a speedy manner. The new product, Kenya Sensitivity Atlas and its GIS database is taking advantage of technology advancement to provide the much needed support in effective decision process for management of the Marine and Coastal Area of Kenya. The principal approach here is the move from static atlas to a GIS electronic atlas.

Notes: 6486

'File' Attachments: internal-pdf://kensea_rapport-0417129472/kensea_rapport.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 487

Author: R. Kibiwot

Year: 2008

Title: The Formulation Of Kenya's Integrated Ocean Management Policy Including Institutional Framework

City: New York, USA

Institution: Division for Ocean Affairs and the Law of the Sea (DOALOS) Office of Legal Affairs, United Nations New York, USA

Publisher: U. United Nations New York

Short Title: The Formulation Of Kenya's Integrated Ocean Management Policy Including Institutional Framework

Keywords: Coastal, Management

Abstract:

Kenya is in the process of formulating her integrated ocean management policy including an

institutional framework to guide the use and management of ocean space and resources within it. The policy is intended to identify critical ocean related issues and activities and subsequently provide a sound legal and institutional approach within which they can be addressed in a holistic manner. It is apparent that the key opportunities and threats related to the coastal and ocean regimes are not only multidimensional but also closely interlinked, thus the need for coordinated management approach if sustainable use of the associated resources is to be achieved for the present and future generations. This strategy can only be realized through the harmonisation of activities and programmes related to the coastal and marine areas and having in place an effective legal and institutional mechanism. This report therefore outlines proposals related to the vision, objectives, values and principles among other iterations meant to provide a logical approach towards an integrated ocean management policy process. It postulates that the ocean policy framework should be realistic, responsive and flexible enough to accommodate the various management strategies dealing with the competing marine uses and the various interest groups while taking into account the health of the associated ecosystems as a matter of priority. It also stresses the significance of other supporting elements such as adequate funding; monitoring, evaluation and adjustments; maritime security; maritime education and research; quality ocean data and the involvement of all stakeholders in the whole process under the guidance of a relevant and able government organ in the achievement of the overall vision and objectives of the policy.

Notes: 6487

'File' Attachments:

internal-pdf://kibiwot_0708_kenya[1]-2927967488/kibiwot_0708_kenya[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 488

Author: CDA, KMFRI, KWS, FD, MMC and KAHC

Year: 1996

Title: Towards Integrated Management and Sustainable Development of Kenya's Coast

City: Mombasa

Institution: Communications Unit at the University of Rhode Island's Coastal Resources Center:

Publisher: U. o. R. I. s. C. R. C. L. Squillante

Short Title: Towards Integrated Management and Sustainable Development of Kenya's Coast

Keywords: Integrated, Coastal, Management

Abstract:

The wise use of Kenya's coastal resources and environment is critical to the nation's development and its people's well-being. Nowhere is this more evident than in the Nyali-Bamburi-Shanzu area, the heart of the North Coast tourism region. Tourism is Kenya's leading foreign exchange earner, with coastal tourism representing 60 to 70 percent of total tourism earnings. North Coast in general, and the Nyali-Bamburi-Shanzu area in particular, are significant contributors to both the local and national economies. Therefore, sustaining and even increasing the benefits of this industry are important.

Notes: 6488

URL: <http://www.crc.uri.edu/download/KenyaActionStratFull.pdf>

'File' Attachments:

internal-pdf://KenyaActionStratFull[1]-3883418368/KenyaActionStratFull[1].pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Report

Record Number: 489

Author: D. Munga

Year: 2005

Title: Freshwater Shortage and Groundwater Quality in Mombasa

City: Mombasa

Institution: Kenya Marine and Fisheries Research Institute, Coast Development Authority

Pages: 12 Pages

Short Title: Freshwater Shortage and Groundwater Quality in Mombasa

Keywords: Marine, Freshwater, Ground water

Abstract: Mombasa district heavily depends on water sources from outside the district. The supply is supplemented by groundwater sources in the district. The daily water demand is 200,000 cubic meters of water against the available 130,000 cubic meters obtained from the traditional supply sources of Kwale, Malindi and Taita-Taveta. The shortfall of 70, 000 cubic meters, about 35 % of the demand, is met by tapping the groundwater sources in the district. In addition, as the reticulated supplies experience frequent breakdowns, groundwater sources very often become the major source of water available in the district. In fact, 13,286 out of the 183,540 households in the district are almost permanently dependant on groundwater. These are distributed as follows:- wells - 6,245 households, boreholes - 6,941 households (GOK, Kenya Population Census 1999). A significant number of the population therefore relies on groundwater for their potable needs.

Notes: 6489

'File' Attachments: internal-pdf://Kenya-0019457281/Kenya.doc

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 490

Author: E. Dutrieux, S. Canovas, J. Denis, Y. Henocque, Q. e. J.P. and L. Bigot

Year: 2000

Title: Guidelines for vulnerability Mapping of coastal zone in the Indian ocean

Journal: IOC Manuals and Guides

Volume: 38

Pages: 44

Type of Article: Manuals and Guidelines

Short Title: Guidelines for vulnerability Mapping of coastal zone in the Indian ocean

Legal Note: Kenya**Keywords:** Sensitivity mapping, Vulnerability Mapping, Coastal mapping, Indian ocean

Abstract: The cooperation between ACP countries and the European Union places a high priority on environmental protection and the preservation and restoration of natural equilibria in the ACP States. The EU is particularly active in the Indian Ocean, where it intervenes in several areas either bilaterally or in the framework of the Regional Environmental Programme (REP), for the promotion of a long-term natural resource management policy, particularly in coastal zones. Protecting the environment while guaranteeing the inhabitants of these Island states an adequate standard of living - particularly inhabitants of coastal zones - requires not only a socioeconomic approach, but also the implementation of rational policies concerning the use of resources, to ensure their long-term availability for future generations. Therefore, today's decision-makers must have access to viable data which can only be collected, processed and analyzed with the help of decision-aids, including the methodology described in this guide. We hope that this guide, compiled through regional experience, will reinforce existing cooperation between the Island States in this part of the Indian Ocean and act as a forerunner for other tools of this type. The promotion of harmonized methods and tools for integrated coastal zone management and suggestions for operational solutions adapted to the problems identified, are key aspects of this regional policy. The publication of this work by the IOC's Regional Environmental Programme, in partnership with UNESCO, forms part of a spirit of exchange of knowledge and experience developed with the help of the IOC. It will, undoubtedly, prove to be an invaluable tool for actors concerned with the long-term management of IOC Member State resources.

Notes: 6490**URL:** unesdoc.unesco.org/images/0012/001212/121250eo.pdf**'File' Attachments:** internal-pdf://121250eo-3096780544/121250eo.pdf**Language:** English**Reference Type:** Report**Record Number:** 491**Author:** M. Munga, P. Gwada, M. Mwanguni and J. Ochiewo**Year:** 2001**Title:** Socio-Economic Root Causes Of Biodiversity Loss In The Priority Sites of The East African Marine ECoregion**City:** Mombasa-Kenya**Institution:** Kenya Marine and Fisheries Research Institute**Pages:** 32 Pages**Publisher:** W. W. F. f. N. (WWF)**Short Title:** Socio-Economic Root Causes Of Biodiversity Loss In The Priority Sites of The East African Marine ECoregion**Keywords:** Eastern African Marine Ecoregion, Lamu-Kiunga, Mida-Malindi

Abstract: This report is an output of the analysis of the root causes of biodiversity loss in the WWF Eastern African Marine Ecoregion (EAME), focusing on the sites of global significance in Kenya, namely Lamu-Kiunga and Mida-Malindi. The output is a contribution to the EAME process with the aim of developing an appropriate conservation strategy for the region. The

Kenyan coast, rich in biodiversity, supports livelihood earnings for the local community and to the economy of the country. Currently, biodiversity experiences a lot of pressure from the rapidly growing population and associated human activities, among other pressures.

Notes: 6491

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book

Record Number: 492

Author: D. B. a. N. Meyer-Ohlendorf

Year: 2006

Title: United Nations Framework Convention on Climate Change: Handbook.

City: Bonn Germany

Publisher: UNFCCC secretariat

Number of Pages: 220 Pages

Type of Work: Handbook

Short Title: United Nations Framework Convention on Climate Change: Handbook.

Keywords: UNFCCC

Abstract: This handbook provides an overview of the United Nations Framework Convention on Climate Change (the Convention) as of August 2006. It focuses on the institutional framework of the Convention and the actions taken by the Conference of the Parties to the Convention (COP). It touches on some aspects of the Kyoto Protocol but it is first and foremost a handbook to the Convention. The handbook has two parts. Part I describes the institutions, Parties, observers and procedures of the Convention; Part II provides information on the thematic work within the Convention such as mitigating climate change, adapting to it, providing financial resources, developing and transferring technology, building capacity and communicating information about implementation. It also describes the dialogue on further long-term actions agreed in Montreal in December 2005. The handbook aims to serve as a reference for those interested in and working on the issues around climate change. It is designed to provide an easy route to understanding the climate change negotiations under the Convention.

Notes: 6492

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book

Record Number: 493

Author: UNESCO-IOC

Year: 2009

Title: African Oceans and coasts

Series Editor: M. O. Odido and S. Mazzilli

City: Nairobi

Publisher: UNESCO

Number of Pages: 163pp

Date: 2009

Type of Work: Handbook

Short Title: African Oceans and coasts

ISBN: 92-9158-017-1

Call Number: IOC/INF-1255

Keywords: East Africa ocean

Abstract: The Ocean Data and Information Network for Africa(ODINAFRICA) brings together more than 40 marine related institutions from twenty five countries in Africa (Algeria, Angola, Benin, Cameroon, Comoros, Congo, Cote d 'Ivoire, Egypt, Morocco, Mozambique, Namibia, Nigeria, Senegal, Seychelles, South Africa, United Republic of Tanzania, Togo, and Tunisia). ODINAFRICA has made substantial contribution to development of African Sea level network that comprises more than 40 tide gauges installed and maintained by several organizations including national agencies and international programmes. It provides access to maps, images, data and information among other datasets to a wide range of users.

Notes: 6493

URL: <http://www.odinafrica.org/index.php/learn-about-odinafrica>

'File' Attachments: internal-pdf://185095e-2533780480/185095e.pdf

Author Address: UNESCO Regional Bureau for Science and technology in Africa Box 30592, Nairobi, 00100

Access Date: 2009

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Book

Record Number: 494

Author: U. N. E. Programme

Year: 1998

Title: East Africa Atlas of Coastal Resources

City: Nairobi

Publisher: UNESCO

Number of Pages: 119 Pages

Type of Work: Handbook

Short Title: East Africa Atlas of Coastal Resources

Keywords: Coastal resources, Kenya, East Africa Atlas

Abstract: This book describes the contents of the EAF/14 database which comprises of the coastal and Marine Environmental resources in the Eastern African Region (Somalia, Kenya, Tanzania, Mozambique, Comoros, Madagascar, Mauritius, Seychelles and France(Re Union))

Notes: 6494

'File' Attachments: internal-pdf://Kenyan Coastal Atlas-2957364480/Kenyan Coastal Atlas.pdf

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 495

Author: G. o. Kenya

Year: 2007

Title: Kenya Vision 2030

Journal: Government Printers

Pages: Government Printers

Type of Article: Government Policy Document

Short Title: Kenya Vision 2030

Legal Note: Kenya

Keywords: Planning strategy, Development, Pillars, .

Economic pillar, social pillar, political pillar, development

Abstract: Kenya Vision 2030 is the country's development blueprint covering the period 2008 to 2030. It aims to transform Kenya into a newly industrialising, "middle-income country providing a high quality life to all its citizens by the year 2030". The Vision is based on three "pillars": the economic, the social and the political. The economic pillar aims to improve the prosperity of all Kenyans through an economic development programme, covering all the regions of Kenya, and aiming to achieve an average Gross Domestic Product (GDP) growth rate of 10% per annum beginning in 2012. The social pillar seeks to build a just and cohesive society with social equity in a clean and secure environment. The political pillar aims to realise a democratic political system founded on issue-based politics that respects the rule of law, and protects the rights and freedoms of every individual in Kenyan society

Notes: 6495

'File' Attachments: internal-pdf://Vision2030_Kenya-2232126720/Vision2030_Kenya.pdf

Language: English

Reference Type: Government Document

Record Number: 496

Author: R. o. Kenya

Year: 2009

Title: Economic Survey 2009.

Department: K. N. B. o. Statistics

Publisher: Government Printers

Government Body: Kenya

Keywords: Economic growth, GDP, macroeconomic variables

Abstract: This is a Kenya Government publication. It presents highlights of the Kenyan economy for 2008 and key socio-economic statistics for the period 2004-2008. It concludes that Kenya experienced remarkable sustained economic growth for the period 2003 – 2007 with the GDP growth rate reaching 7.1 percent in 2007, the highest growth rate over the period. With stable macroeconomic variables, the economy was estimated to expand by between 2.0 and 3.0 per cent in 2009

Notes: 6496

Last Modified Date: Veronica wanjeri

Language: English

Reference Type: Government Document

Record Number: 497

Author: G. o. Kenya

Year: 2008

Title: Kenya State of the Coast Report: towards the integrated management of Kenya's coastal and marine resources

Department: National Environment Management Authority

City: Nairobi, Kenya.

Publisher: UNEP and NEMA

Pages: 108pp

Government Body: Kenya

Keywords: Coastal communities

economic activities

threats and impacts

governance

marine environment

coastal Environment

Abstract: The State of the Coast Report is the first of its kind in Kenya. It describes the status of Kenya's coastal and marine environment, demographic and resource-use trends, current impacts and threats to sustainability, and management measures to mitigate and prevent continued environmental degradation. The document will serve as the foundation for the development of an Integrated Coastal Zone Management (ICZM) Plan for Kenya.

Notes: 6497

Research Notes: This publication may be reproduced in whole or part in any form for educational purposes and non-profit purposes without special permission from the copyright holder, provided that acknowledgement of the source is made.

'File' Attachments:

internal-pdf://Kenya_State_of_Coast_Report[1]-2551096320/Kenya_State_of_Coast_Report[1].pdf

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Government Document

Record Number: 498

Author: G. o. Kenya

Year: 2007

Title: Economic Survey 2005

Department: K. N. B. o. Statistics

City: Nairobi

Publisher: Government Printers

Government Body: kenya

Keywords: Performance of Kenya's economy, Gross Domestic Product, economic growth

Abstract: This is a Kenya Government publication of the national economic survey report. It

presents a detailed analysis of the performance of the various sectors of the Kenyan economy in 2005 and compares the performance with that of the previous year.

Notes: 6498

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Report

Record Number: 499

Author: H. L. Blackett

Year: 1994

Title: Forest Inventory Report No. 4. Shimba Hills, Mkongani North and Mkongani West.

Institution: Kenya Indigenous Forest Conservation Project (KIFCON)

Type: Report

Short Title: Forest Inventory Report No. 4. Shimba Hills, Mkongani North and Mkongani West.

Keywords: Forest, inventory

Notes: 6499

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Government Document

Record Number: 500

Author: G. o. Kenya

Year: 2003

Title: Geographical Dimensions of well being in Kenya. Where Are the Poor

Department: K. N. B. o. S. (KNBS)

City: Nairobi

Publisher: Government Press

Volume: Vol. 1.

Government Body: kenya

Abstract: This is a GIS presentation of the distribution of wealth/poverty in Kenya

Notes: 6500

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Government Document

Record Number: 501

Author: G. o. Kenya

Year: 2002

Title: Poverty Reduction Strategic Action Plan 2002-2005

Department: K. N. B. o. S. (KNBS)

City: Nairobi

Publisher: Government Printers

Government Body: Kenya

Keywords: Poverty, strategic action plan

Abstract: This national strategic action plan provided a roadmap for the reduction of poverty in Kenya in the period 2002-2005

Notes: 6501

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Book

Record Number: 502

Author: J. Hoorweg, D. Foeken and R. A. e. Obudho

Year: 2000

Title: Kenya Coast Handbook: Culture, Resources and Development in East African Littoral

City: Leiden, The Netherlands

Publisher: African Studies Centre

Type of Work: Book

Short Title: Kenya Coast Handbook: Culture, Resources and Development in East African Littoral

Keywords: Population distribution, agro-ecological zones, administrative policy:

Economy - potential | Development - constraints | Infrastructure - constraints | Planning - regional

Abstract: This publication presents the demographic characteristics of the coast, factors that have influenced the distribution of population, and the disparities caused by tourism development in some areas of the coast.

Notes: 6502

Last Modified Date: Veronica wanjeri

Language: English

Reference Type: Government Document

Record Number: 504

Author: N. E. M. Authority

Year: 2004

Title: State of Environment Report

Department: N. E. M. Authority

City: Nairobi

Government Body: Kenya

Congress Session: population

Keywords: Population size, population density, housing, male population, female population

Abstract: This publication presents the results of the national population and housing census that was carried out in 1999. It is the most comprehensive report on the demographic characteristics of Kenya. The publication has comprehensive data on the demographic characteristics of the Kenyan coast. The national population census is carried out after every ten years to provide not only data on the demographic characteristics but also on the socio-economic conditions.

Notes: 6503

Last Modified Date: Veronica wanjeri

Language: English

Reference Type: Government Document

Record Number: 505

Author: R. o. Kenya

Year: 2005

Title: Statistical Abstract 2005

Department: K. N. B. o. Statistics

City: Nairobi

Publisher: Government Printers

Government Body: Kenya

Congress Session: Population

Keywords: Population, district, agriculture, tourism

Abstract: This is a comprehensive compilation of statistics from all sectors of the Kenyan economy. It covers statistics on the demographic characteristics of the country as well as the various economic sectors.

Notes: 6504

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Report

Record Number: 506

Author: N. M. o. Kenya

Title: Sacred Cultural Sites – the Mijikenda Kayas

Institution: National Museums of Kenya

Type: Report

Short Title: Sacred Cultural Sites – the Mijikenda Kayas

Keywords: Sacred cultural sites, monuments

Notes: 6505

Last Modified Date: Veronica Wanjeri

Language: English

Reference Type: Report

Record Number: 507

Author: UNEP/FAO/PAP/CDA

Year: 2000

Title: Progress in integrated coastal management for sustainable development of Kenya's coast: The case of Nyali-Bamburi-Shanzu Area

City: Split Croatia

Publisher: E. A. R. S. T. R. S. N. 6.

Type: Technical Report

Short Title: Progress in integrated coastal management for sustainable development of Kenya's coast: The case of Nyali-Bamburi-Shanzu Area

Keywords: Integrated coastal area management

Notes: 6506

Last Modified Date: Veronica Wanjeri
Language: English

Reference Type: Conference Paper
Record Number: 508
Author: W. Bank
Year: 1996
Title: Meeting the Challenges of Mega Cities in the Developing World: A Working Paper.
Conference Location: Washington, DC.
Publisher: World Bank
Type: Working Paper
Pub Place: Kenya
Notes: 6507
Last Modified Date: Veronica Wanjeri
Language: English

Reference Type: Web Page
Record Number: 509
Author: W. Bank
Year: 2007
Title: Key Development Data and Statistics
Publisher: World Bank
Short Title: Key Development Data and Statistics
Year Cited: Kenya
Keywords: GDP
Abstract: Data and statistics on population and economic variables such as GDP and GDP per capita are highlighted
Notes: 6508
Research Notes: This publication was downloaded from the World Bank website on 11 August 2007
URL: <http://econ.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0>
Last Modified Date: Veronica Wanjeri
Language: English

Reference Type: Conference Paper
Record Number: 92
Author: T. N. C. Bezerra, I. G. De Mesel, S. Bouillon, A. Vanreusel and T. Moens
Year: 2007
Title: Diversity and structure of nematode communities across mangrove and seagrass vegetations at Gazi Bay, Kenya
Conference Name: Thirteenth International Meiofauna Conference (THIRIMCO)
Conference Location: Recife, Brazil:
Publisher: VLIZ-Integrated Marine Information System-IMIS
Date: July 29 - August 3

Pub Place: Kenya

Keywords: Carbon source, Meiofauna, Tidal range, Mangrove, Sea grass, Density, Diversity.

Abstract: Mangrove benthos has long been assumed to rely primarily on mangrove litter fall, but in recent years, several studies have shown that bacteria, macrobenthos and meiobenthos may preferentially utilize more labile sources such as microphytobenthos and inwelled phytoplankton and seagrass detritus from adjacent shallow waters. The relative importance of these different carbon sources for different consumer taxa, however, remains unclear. We have studied the meiofauna at Gazi Bay, Kenya, based upon samples of a dozen stations from the supralittoral down to the shallow subtidal, covering different mangrove and seagrass vegetations. Nematoda were by far the most abundant taxon throughout the area, followed by Oligochaeta and, depending on the station investigated, Harpacticoida, Polychaeta, Kinorhyncha, and Ostracoda. We identified 135 nematode genera, with a range of 19 – 60 per station. We hypothesized that densities and genus diversity of nematodes could be linked to sediment organic matter (OM) quantity and quality. For both nematodes and oligochaetes, total densities were indeed positively correlated with OM content, but not with C:N ratio as a measure of OM quality. Nematode genus diversity did not show any clear trend with OM quantity or quality. The most common genus overall was *Daptonema*, followed by *Microlaimus*, *Desmodora*, *Metachromadora* and *Spilophorella*. We will present data from a nematode community analysis highlighting shifts in community composition and in 'dominant' genera across different vegetation types. Finally, we will present results from a short-term field experiment in which the colonization of fresh mangrove litter fall by nematodes was followed using in situ litter bag incubations.

Notes: 9092

'File' Attachments: [internal-pdf://131758\[1\]-3438799360/131758\[1\].pdf](internal-pdf://131758[1]-3438799360/131758[1].pdf)

Last Modified Date: Emmanuel Mbaru

Language: English

Reference Type: Journal Article

Record Number: 141

Author: Y. Samyn and E. V. Berghe

Year: 2000

Title: Annotated checklist of the echinoderms from the Kiunga Marine National Reserve, Kenya. 1. Echinoidea and Holothuroidea.

Journal: Journal of East African Natural History

Volume: 89

Pages: 1-36

Short Title: Annotated checklist of the echinoderms from the Kiunga Marine National Reserve, Kenya. 1. Echinoidea and Holothuroidea.

Legal Note: Kenya

Keywords: Annotated, checklist, echinoderms, Kiunga Marine National Reserve, Kenya.

Abstract: The echinoderms fauna of the Kiunga Marine National Reserve, Kenya, is documented, based on the results of a field trip, and additional information from the literature. In this first paper, the Echinoidea and Holothuroidea are discussed. A total of 91 specimens representing 8 orders, 13 families, 19 genera and 37 species were collected. Five other species were not

collected in the field. Six additional species are reported from literature only and are not discussed. Diagnostic characters of every species recorded are given, as well as an assessment of their abundance in the Kiunga Marine Reserve. *Clypeaster rarispinus*, *Phyllacanthus imperialis*, *Microcyphus rousseaui* (Echinoidea), *Holothuria (Cystipus) rigida*, *Holothuria (Platyperona) difficilis*, *Labidodemas pertinax*, *Stichopus chloronotus* and *Stichopus cf. monotuberculatus* (Holothuroidea) are new records for Kenya. *Holothuria (Theelothuria) turriscelsa* is a new record for the Indian Ocean. This study stresses the importance of the Kiunga Marine National Reserve as a sanctuary in the conservation of the marine invertebrate fauna.

Notes: 60141

'File' Attachments: <internal-pdf://Samyn2000-0376321792/Samyn2000.pdf>

Language: English