National Report: Marine biodiversity in Kenya – the known and the unknown

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INTRODUCTION

The Kenyan coastline is about 600 km in length and forms part of the western border of the Indian Ocean. It has an almost continuous fringing coral reef usually running parallel to the coast. Kenya's territorial sea and Exclusive Economic Zone extend 12 nm and 200 nm respectively, with the total area of EEZ being 118 km^2.

The Kenyan coast runs in a southwesterly direction from the Somalian border in the north $1^o41'S$ to $4^o40'S$ at the border with Tanzania. Climate and weather systems on the Kenyan coast are dominated by the two distinct monsoon periods. From November to March, the north-east monsoon dominates and is comparatively dry. End of March to September the south-east monsoon dominates bringing heavy rains. Mean annual total rainfall ranges from 508 mm to1016 mm. Relative humidity is comparatively high all year round reaching its peak during the wet months of April and July.

Living coral reefs occur all along the length of the Kenyan coast. A fringing reef colonizes the shallow parts of the continental shelf along most of the Kenyan coastline to a depth of around 45 km and at a distance of between 500 m to 2 km offshore, except where river systems create conditions of low salinity and high turbidity which limit coral growth. The estimated continental shelf area is about 19,210 km^2. Two main rivers drain into the Indian Ocean: the Tana River (850 km) and Sabaki River (650 km). The Tana River enters the sea at Ungwana Bay and discharges 3 million tonnes of sediment per year, while the Sabaki River enters the Indian Ocean north of Malindi and discharges about 2 million tonnes of sediment per year. The sea surface temperature ranges from 24^oC to 29^oC depending on the monsoon season. Salinities vary from a minimum of 34.5 ppt to a maximum of 35.4 ppt.

Coastal Ecosystems and Resources

Marine beaches and dunes: These are lightly vegetated by highly specialized colonizing plants. There are approximately 27,000 ha of beach and dunes in Kenya.

Estuaries and other wetlands: These systems are sheltered from high energy waves and colonized by mangrove trees and associated plants. The Sabaki Estuary contains an important flood plain. Subsistence fisheries for cichlid fish and freshwater prawns are found in coastal wetlands.

Mangroves: There are 9 species of mangrove trees and shrubs found along the Kenyan coast. The mangrove swamps along the Kenyan coast cover 53,000 ha with the largest stands occurring in the Lamu area (460 km^2). Kenyans have traditionally exploited the rich natural products of the mangrove swamp as well as various parts of the trees themselves. Mangrove vegetation has also been cleared for solar salt works and prawn farms. Mangroves are nursery grounds for fish and prawns and support diverse flora and fauna.

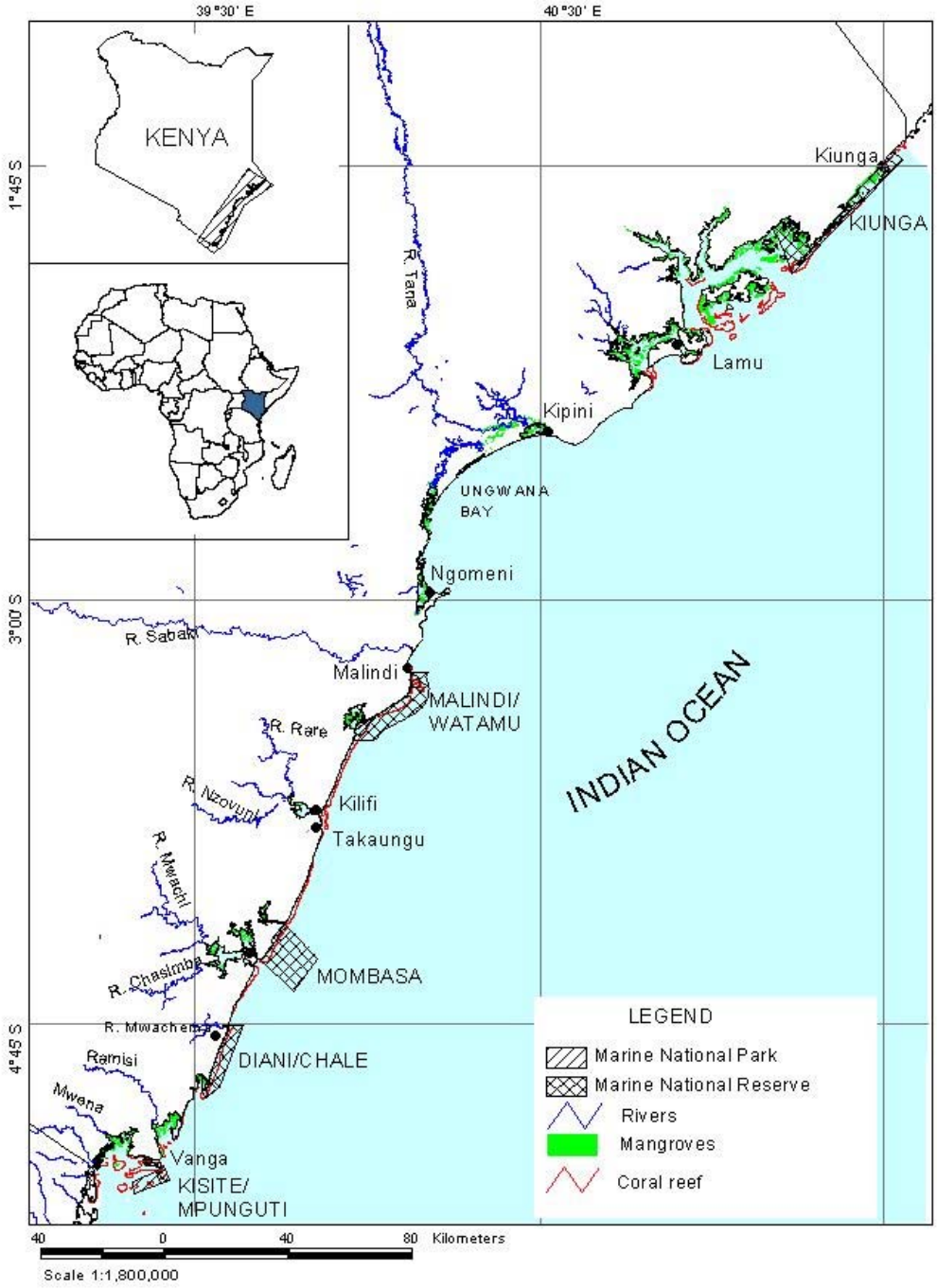

Figure 1: Map of Kenya showing the coastal resources and MPAs (source KeNODC)

Seagrasses and seaweeds: A total of 12 species of seagrasses have been recorded in Kenya, none of which is endemic. Seagrass beds support variety of commercially important fish species, and act as feeding grounds for turtles and dugong. There are more species of red seaweeds than browns and

greens combined. A survey of Kenyan coastal waters has shown that there are no sites with significant stands of commercially important seaweeds. Only two commercially important genera are found in Kenya: *Gracilaria* and *Euchema*.

Corals: Approximately 183 species of corals belonging to 59 genera have been recorded. The total area of coral reef is approximately 50,000 ha; one of the best known reefs being located at Malindi-Watamu. Corals support a variety of fauna and attract tourists.

Fisheries: Only 7.4% of the national total annual fishery production comes from marine waters. Landings by about 5,000 coastal fishermen have remained consistent between 5,000 and 8,000 tonnes. Commercial prawn trawling also is also important.(Eastern Africa Atlas,1998)

THE KNOWN

Both local and visiting researchers have conducted research on the marine biota of Kenya. However, a lot still needs to be done. Among the taxa that have been adequately researched include the marine plants under the following classes: Anthophyta, Rhodophycota, Chlorophycota and Phaeophycota. Phyla from the animal kingdom that have been adequately researched include Pisces, Crustacea, Mollusca, Aves, Cnidaria, Echinodermata and Mammalia. The diversity of marine animals in Kenya is considerably more than this and a lot more research needs to be undertaken. Coverage of the three major ecosystems (mangroves, corals and seagrass beds) has been adequate, but studies on other habitats (such as the benthic habitats) have been minimal. The total biodiversity in Kenya is unknown, as are the levels of endemicity.

Estimates of marine species documented from Kenya, as recorded in databases that include Fishbase (1998) and Marine Species Diversity of Eastern Africa (MASDEA), are listed below:

Plants

Approximately 56 families (over 204 species) of marine plants are known, under the following Classes:

Anthophyta	15
Chlorophycota	62
Cyanophycota	3
Magnoliophycota	1
Phaeophycota	32
Rhodophycota	82
Mangroves	9

Animals

About 345 families (over 1808 species) have been documented, under the following Classes:

Annelida	10
Arthropoda (Crustacea)	343
Pisces	662
Aves	173
Mammalia	25
Reptalia	3
Cnidaria	183

Echinodermata	93
Mollusca	297
Platyhelminthes	17
Porifera	2

Species list for Kenyan finfish are known to be incomplete. Only one biotope, the mangrove swamps, has been studied in any detail. Studies in the Gazi mangrove creek identified 109 finfish species belonging to 44 families. Over 80 species of gastropods and bivalves find their way into curio shops and fish markets. A total of 450 species of birds are found on the coast and adjacent interior (Eastern Africa Atlas, 1998).

Twelve coastal and marine species are known to be endemic to Kenya:

Mammals	6
Birds	4
Fish	1
Plant	1

Endemic to Kenya and Tanzania:

Birds	6
Birds	2 (and Mozambique)

The coastal zone appears to be the habitat for the majority of Kenya's Internationally IUCN threatened species. Of the 159 species of threatened trees and shrubs, 38% come from the coast; of the 71 threatened bird species 27% inhabit the coast, while of the 9 threatened mammal species 55% are located on the coast (Eastern Africa Atlas, 1998).

Endangered marine species	Green and Hawksbill turtles
Vulnerable	Loggerhead turtle and dugong
Rare	3 bird species and a mollusc
Commercially threatened	2 molluscs and spiny lobster

The gaps identified in the information on marine biodiversity in the Eastern African region led to the development of MASDEA, a taxonomic/geographical database on marine species of the region. Data entry was started in1996 by Dr E. Van den Berghe at the Kenya Marine & Fisheries Research Institute and was supported by the RECOSCIX-WIO Project (Regional Cooperation for Scientific Information Exchange). The database is accessible on http://www.vliz.be/vmdcdata/Masdea/about.htm and is hosted by the Flanders Marine Institute, Belgium. In spite of the existence of a number of taxonomic databases, there is still a lack of this important information specific for this region. Furthermore, these databases cover mainly terrestrial species or are based on specific groups.
Consequently the database was developed with the following objectives:

1. Collect all available literature on the marine species of the region.
2. Enter data on the species into the database.
3. Seek the support of taxonomic experts (of different groups) of the region.
4. Search for more literature to be entered in the database.
5. Eventually make the database available to scientists in the region and beyond.

The database is useful in conservation in that it gives knowledge on the diversity of the species in the region. One can keep track of extinct species and also keep track of old information and literature. Current and valid names as well as synonyms of species are clearly indicated as well as the authority

(author who described the species) thereby avoiding confusion. The database also includes accounts for newly discovered species. The database has entries for 21 countries and regions within the Western Indian Ocean.

THE UNKNOWN

The coastal and marine environments of Kenya are very rich in biotic resources, yet they are the least studied of Kenyan natural environments and there are a number of significant gaps in baseline information.

Considerable research work on the Kenyan coast has been carried out by visiting scientists. Local scientists are limited by financial support and lack of appropriate facilities. Expertise is restricted to mostly the environmental and ecological fields, with taxonomy poorly represented. This has led to limited taxonomical information on the marine biota of Kenya. Taxa that have been neglected include Annelida and Porifera. Even among the adequately covered classes (Crustacea, Cnidaria) some taxa have been poorly studied, e.g. Mysidacea, Amphipoda, Ostracoda, Cirripedia and Pycnogonida. In addition, the Nudibranchia, Bryozoa, Nemertea and Tunicata have also been largely ignored.

Adequate taxonomic keys are a major limitation. Among the seagrass beds and corals, smaller fauna utilising these habitats and have been poorly researched. Benthic habitats have received little attention despite their importance in the marine ecosystems.

CURRENT THREATS

Increased demands for marine resources have resulted in significant changes along the Kenyan coast. These changes were brought about because of a number of threats that include:

- Overexploitation of marine resources: overfishing has resulted in declining fish resources and disappearance of some species e.g. holothurians.
- Destruction of habitats through cutting of mangroves and destructive fishing methods such as seine nets and poisons as well as commercial trawling. Careless collection methods in the corals are on the increase. Conversion of mangrove areas to prawn farms, e.g. Ngomeni area.
- Pollution: land and marine based pollutants, domestic effluents, chemicals and eutrophication.
- Sedimentation, resulting from the erosion of agricultural land. This has been on the increase resulting in one of the major rivers (Sabaki) changing its course.
- Urbanization and unplanned development.
- Natural threats such as El Nino, and localised changes in sea temperatures have impacted on the corals and mangroves.

MARINE PROTECTED AREAS IN KENYA

Kenya led Africa with the establishment of the continent's first marine protected areas in 1968. These areas were primarily designed to conserve Kenya's coral reefs and which form biodiversity hot spots. There are five MPAs in Kenya and they are managed by the Kenya Wildlife Service (KWS).

Malindi Marine National Park

The Malindi Marine National Reserve encloses Watamu and Malindi Marine National Parks. These were set up in 1968. The area also includes several coral islets, notably Whale Island at the entrance to Mida Creek in the Watamu Marine National Park. The reserve is 213 km^2 forming a complex of marine and tidal habitats on Kenya's North Coast. It extends 5 km into the sea and stretches 30 km along the coast from Malindi town to beyond the entrance to Mida Creek. Habitats include intertidal rock, sand and mud; fringing reefs and coral gardens; beds of sea grass; coral cliffs, platforms and islets; sandy beaches and mangrove forests. Mida Creek is a large, almost land locked expanse of saline water, mangrove forest and intertidal mud protected in the Watamu Marine Reserve.

Watamu Marine National Park

Watamu National Park is part of a complex of marine and tidal habitats on Kenya's North coast stretching from Malindi town to beyond the entrance to Mida Creek. It is enclosed by the Malindi Marine National Reserve that also encloses Malindi Marine National Park. Habitats include intertidal rock, sand and mud; fringing reefs and coral gardens; beds of sea grass; coral cliffs, platforms and islets; sandy beaches and Mida Creek mangrove forest. The park was designated as a Biosphere reserve in 1979.

Mombasa Marine National Park & Reserve

The park is 10 km^2 while the reserve is 200 km^2. These were established in 1986. Both the park and reserve are the most highly utilised among marine protected areas. Their coastline is heavily developed with tourist facilities. The Coral gardens and the beach are the major attractions.

Kiunga Marine National Reserve
Kiunga Marine National Reserve (set up in 1979) incorporates a chain of about 50 calcareous offshore islands and coral reefs in the Lamu Archipelago, running for some 60km parallel to the coastline off the northern most coast of Kenya and adjacent to Dodori and Boni National Reserves on the mainland. Composed of old, eroded coral, the islands mainly lie inland around 2km offshore and inshore of the fringing reef. They vary in size from a few hundred square metres to 100 ha or more. Their walls rise sheer from the surrounding seabed and are usually deeply undercut on the landward side. The small outer islands provide nest sites for migratory seabirds. The reserve conserves valuable coral reefs, sea grass meadows and extensive mangrove forests, with their attendant biodiversity and is also a refuge for sea turtles and dugongs.

Kisite Marine Park & Mpunguti Reserve
Kisite and Mpunguti Marine Parks (gazetted in 1973 and 1978 respectively) are located on the south coast off Shimoni and south of Wasini Island in Kwale District on the south Kenyan coast near the Tanzanian border. Kisite Park covers 11 km^2 while Mpunguti reserve covers 28 km^2. The complex covers a marine area with four small islands surrounded by coral reef.

Two more protected areas have been proposed: The **Tana River Delta Wetland Reserve** and the **Diani Chale Marine Reserve**.

The World Wildlife Fund has made efforts to set up the Eastern African Marine Ecoregion (EAME), which is part of the larger Western Indian Ocean Region. The ecoregion approach recognises that the protection of biodiversity is an integral component of protecting resources and the economies and social fabrics that depend on them. In Kenya the following areas rich in biodiversity are included in the EAME: Lamu Archipelago, Mida Creek-Malindi, Tana River Delta, Msambweni-Tanga, Tanzania (EAME Proceedings, 2001).

Kenya has made a number of International commitments to the protection of the coastal and marine environment and its resources. Some of these include:

- Convention on the Continental Shelf, Geneva, 1958. Kenya ratified this convention on 20 September 1969.
- Convention on the prevention of marine pollution by dumping of wastes and other matters, London, 1972. Kenya ratified this convention on 17 January 1976.
- Convention for the Conservation of Migratory Species of Wild Animals (1979).
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973).
- Convention on Biological Diversity (1992)
- Nairobi Convention for the Protection, Management and Development of the Marine Environment and the coastal areas of the East African Region (1996).
- RAMSAR Convention on Wetlands of International Importance especially as Waterfowl habitat (1971).

The Kenyan government has the responsibility of creating national legislation that ensures the implementation of these agreements.

CAPACITY

Human Capacity (Taxonomists and Conservationists)

Kenyans

Name	Expertise	Contact
Enoch Wakwabi	Prawns	enochwakwabi@yahoo.com
James Kairo	Mangroves	jgkairo@kmfri.co.ke
Agnes Muthumbi	Nematodes	amuthumbi@uonbi.ac.ke
David Olendo	Turtles	
Joseph Wakibia	Algae	jwakibia@kmfri.co.ke
Nyawira Muthiga	Corals, Echinoderms	nmuthiga@africaonline.co.ke
David Obura	Corals	dobura@cordio.info
Melckzedeck Osore	Copepods	mosore@kmfri.co.ke
James Mwaluma	Copepods	jmwaluma@kmfri.co.ke
Renison Ruwa	Decapods	kruwa@kmfri.co.ke
Julius Okondo	Benthos	jokondo@kmfri.co.ke
Gerald Mwatha	Fish	gmwatha@kmfri.co.ke
Gladys Moragwa	Turtles	gokemwa@kmfri.co.ke
Esther Fondo	Decapods	efondo@kmfri.co.ke
Edward Kimani	Oysters	ekimani@kmfri.co.ke
Jacqueline Uku	Seagrasses	juku@kmfri.co.ke
Peter Wawiye	Phytoplankton/algae	pwawiye@kmfri.co.ke
Helida Oyieke	Sea weeds	nmk@museums.or.ke
Elizabeth Akinyi	Fresh water fishes	nmk@museums.or.ke
Dalmas Oyugi	Marine fishes	doo@iucnearo.org
George Gatere	Fresh water diatoms	nmk@museums.or.ke
Paul Webala	Mammals	nmk@museums.or.ke
Alfred Owino	Water birds	nmk@museums.or.ke
Collins Handa	Marine Snails	nmk@museums.or.ke
Nathan Gichuki	Water birds	nmk@museums.or.ke
Patrick Gwada	Mangroves, seagrass	pgwada@kmfri.co.ke
Stephen Mwangi	Microbiology	smwangi@kmfri.co.ke

Visiting scientists

A number of visiting scientists have been active workers on the marine biota of Kenya and the Western Indian Ocean region. Some of these scientists are listed below.

Name	Expertise	Contact
Tim Mc Clanahan	Corals	crcp@africonline.co.ke
Jan Mees	Mysids	jan.mees@vliz.be
Tim Deprez	Mysids	Tim.Deprez@rug.ac.be
Tris Wooldridge	Mysids	zlathw@up.ac.za
Didier V. Spiegel	Ophiuroidea	Spiegel@africamuseum.be
Michel Jangoux	Asteroidea	mjangoux@ulb.ac.be
Yves Samyn	Echinoderms	ysamyn@vub.ac.be
Claude Massin	Echinoderms	Claude.Massin@naturalscience.be
Ahmed Thandar	Echinoderms	thandar@pixie.udw.ac.za

Eric Coppejans	Algae	eric.coppejans@rug.ac.be
Marco Vannini	Decapods	vannini_m@DBAG.UNIFI.IT
S. Cannicci	Decapods	cannicci@DBAG.UNIFI.IT
F. Dahdouh-Guebas	Mangroves	fdahdouh@vub.ac.be
Leon Bennun	Birds	Leon.bennun@birdlife.uk
Charles Sheppard	Corals	Warwick University
Nest Schockaert	Flatworms	
Yehuda Benayahu	Corals	YehudaB@tauex.tau.ac.il

Institutional Capacity

The National Museums of Kenya keeps all specimen collections. Visiting scientists and cruises also have collections and some of the holdings in other Institutions are shown in the table below.

Institution	**Collections**	**Documentation Status**	**Contact person**
University Museum of Zoology, Cambridge	Invertebrates (9) Fish (3)	Preparing electronic catalogue	Ray Symonds rjs13@cam.ac.uk
The Natural History Museum of London	Algae Others	Database	Ms. Jenny Bryant j.Bryant@nhm.ac.uk
Swedish Museum of Natural History	Molluscs Oligochaetes (4)	Not catalogued e-database	Anders Waren Anders.waren@nrm.se
Zoological Museum University of Copenhagen	Rotifers	Mounted	Martin Sorensen mvsorensen@zmuc.ku.dk
National Museum of Scotland	Molluscs Other invertebrates	Card catalogue	Sankurie Pye s.pye@nms.ac.uk
Smithsonian Institution, National Museum of Natural History	512 marine species: Coelentrata Arthropoda Echinodermata Mollusca Sarcomastigophora Porifera Chordata Annelida Platyhelminthes Nematoda Sipuncula	All online*	Chad Walter WALTER.CHAD@NMNH.SI.EDU Cheryl Bright Bright.Cheryl@nmnh.si.edu
Zoological	Crustacea	e-catalogue in	Bjarne Bisballe

Museum Denmark	Others	preparation	Bbisballe@zmuc.ku.dk
Puglia Museum of Zoology, Italy			
Rome Museum of Zoology	Molluscs	Card catalogue	A. Zilli a.zilli@comune.roma.it
Australian Museum	Crustacea (8)	e-database	Penny Berents pennyb@austmus.gov.au
Oxford University Museum of Natural History	Crustacea	Not identified	Sammy De Graves sammy.degrave@university-museum.oxford.ac.uk
Australian Museum	Fish (8)	e-database	McGrouther markm@austmus.gov.au
Zoology Museum Tel Aviv University	Soft Corals Benthic invertebrates Sponges Tunicates	e-database	Prof. Hudi Benayahu YehudaB@tauex.tau.ac.il
Hungary Museum of Natural History	Molluscs	e-database	Zoltan Feher korsos@zoo.zoo.nhmus.hu
Zoological Museum, University of Florence, Italy	Echinoderms Cephalopods Molluscs Crustacea	Card catalogue	Cecilia Volpi volpi@specola.unifi.it
Royal Belgian Institute of Natural Sciences	Echinoderms Molluscs	e-database	Claude Massin Claude.Massin@naturalscience.be

* http://goode.si.edu/mcs/iz/Query.php
http://www.mnh.si.edu/rc/db/colldb.html

List of institutions/organisations active in marine biodiversity research and conservation

Kenya Marine & Fisheries Research Institution
Kenya Wildlife Service
National Museums of Kenya
Fisheries Department
Forestry Department
National Environment Management Authority
Coast Development Authority
Coral Reef Degradation in the Indian Ocean
Coral Reef Conservation Project
World Conservation Union (IUCN- East Africa Regional Office)
World Wildlife Fund for Nature

Kenya Sea Turtle Conservation Committee
East African Wild Life Society
Nature Kenya (East African Natural History Society)
PACT Kenya
National Oil Spills Response Committee
Beach Management Units (by local communities along the Kenyan coast)
United Nations Environment Programme

BIODIVERSITY REFERENCES

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Aleem, A.A.	1984	Distribution and Ecology of Seagrass communities in the Western Indian Ocean. Deep Sea Research 31: 919-933
Al-Ghais S.M. & R.T. Cooper	1996	Brachyura (Grapsidae, Ocypodidae, Portunidae, Xantidae and Leucosiidae) of Umm Al Quwain mangal, United Arab Emirates. Tropical Zoology 9: 409-430
Anderson, D.T.	1994	Barnacles: Structure, function, development and evolution. Chapman & Hall
Baker, A.N. & L.M. Marsh	1976	The rediscovery of Halityle regularis Fisher (Echinodermata: Asteroidea). Re. West. Aust. Mus. 4(2): 107-116
Bakus, G.J.	1973	The Biology and Ecology of Tropical Holothurians. Biology and Geology of Coral Reefs. 2: 325 - 367.
Bandel, K. & D. Kadolsky	1982	Western Atlantic Species of Nodolittorina (Gastropda: Prosobranchia): comparative morphology and its functional, ecological, phylogenetic and taxonomic implications. Veliger 25 (1): 1-42.
Barnard, K. H.	1925	A Revision of the Family Anthuridae (Crustacea Isopoda), with Remarks on certain Morphological Peculiarities. Journ. Limn. Soc (London) (Zool.) 36: 109-160.
Barnard, K.H.	1950	Descriptive catalogue of South African decapod Crustacea. Ann. S. Afr. Mus 38: 1-837
Barnard, K.H.	1955	Additions to the fauna list of South African Crustacea and Pycnogonida. Annals of the South African Museum 43 (1): 1-107.
Bell, F.J.	1884	Echinodermata. In: R.W. Coppinger (ed): Report on the Zoological Collections made in the indo-pacific Ocean during the voyage of HMS Alert, 1881-2. London.
Berry, L.E.	1954	Africa's rarest cowries. JEANHS XXII (95): 82-85.
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Bhaud, M.	1977	Note sur quelques representants du genre Phyllochaetopterus (Annelides polychetes) et observations au microscope a balayage des soies specialisees. Vie-Milieu A Biol. Mar. 27(1): 11-33.
Bock, K.R.	1975	Preliminary checklist of the fishes of the south bank, Kilifi Creek, Kenya. Journal of the East Africa Natural History Society and National Museum 148.
Böhlke & McCosker	1982	Monopenchelys, a new eel genus, and a redescription of the type species, Uropterygius acutus Parr (Pisces: Muraenidae). Proc. Acad. Nat. Sce Philadelphia 134: 127-134.
Boileau, E.K.	1918	The game fish of Mombasa. JEANHS 6(12): 240-246.
Boileau, E.K.	1916	The Game fish of Mombasa and Malindi. JEANHS 5(10): 65-70.
Brown, L.H., E.K. Urban & K. Newman	1982	The birds of Africa Volume I. Academic Press, London.
Bruce, A.J.	1967	Notes on some indo-pacific Pontoniinae III-IX. Descriptions of some new genera and species from the Western Indian Ocean and the South China Sea. Zoologische Verhandelingen 87.
Bruce, A.J.	1993	The occurrence of the semi-terrestrial shrimps Merguia oligodon (De Man 1888) and M. rhizophorae (Rathbun 1900)(Crustacea Decapoda Hippolitidae) in Africa. Tropical Biology 6: 179-187.
Bruce, A.J.	1974	A synopsis of the pontoniid shrimp fauna of Central East Africa. J. Mar. Biol. Ass.

Author(s):	Year:	Reference:
		India 16(2): 462-490
Bruce, A.J.	1994	Periclimenes gonioporae sp., nov., a new pontoniinid shrimp from Kenya. African Journal of Tropical Hydrobiology and Fisheries 5(I): 45 - 49.
Bruce, A.J.	1974	Abbreviated larval development in the alpheid shrimp Racilius compressus Paulson. Journal of the East Africa Natural History Society and National Museum 147, 1-8
Bruce, A.J.	1971	Onycocaris zanzibarica sp. nov., a new pontoniid shrimp from East Africa. J. Nat. Hist. 5: 293-298
Bruce, A.J.	1973	Notes on some Indo-Pacific Pontoniinae, XXIII. Tectopontonia maziwiae gen. nov., sp. nov., a new coral associate from Tanganyika (Decapoda, Palaemonidae). Crustaceana 24 (2): 169-180.
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Burgess, C.M.	1970	The Living Cowries. AS Barnes and Co, Ltd. Cranbury, New Jersey
Canaris, A.G. & D.G. Murphy	1965	A Scincid reptile feeding primarily on marine crustacea, with a note on its parasites. J.E.A.N.Hist. Soc. XXV (111): 129-130.
Chan, T.Y. & H.P. Yu	1995	The rare lobster genus Palinustus A. Milne Edwards, 1880 (Decapoda: Palinuridae), with description of a new species. J. Crust. Biol. 15(2): 376-394.
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Compagno, L.J.V.	1984	FAO Species Catalogue No. 4. Sharks of the world. An Annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. FAO Fish. Synop. (125) Vol 4, Part 1. 246 pp. FAO, Rome.
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Copley, H.	1938	Recent additions to fish exhibits in the Museum. JEANHS 13(5): 191-192.
Copley, H.	1945	List of cowries collected on the Kenyan coast by Colonel Maxwell and friends during July, 1944. JEANHS XVII (83&84): 160.
Copley, H.	1934	Holacanthus semicirculatus (Cuv). JEANHS 12(1-2): 51.
Cottarelli, V. & G. Mura	1981	Remarks on the Genus Afrolaophonte (Crustacea, Copepoda, Harpacticoida): Description of three new species. Vie et Milieu 31(2):153 - 161.
Crane, J	1975	Fiddler crabs of the world. Ocypodidae: genus Uca. Princeton university press, Princeton, New Jersey. 736 pp.
Crosnier, A.	1987	Les especes indo-ouest-pacifiques d'eau profonde du genre Metapenaeopsis (Crustacea Decapoda Penaeidae). Bull. Mus. Natn. Hist. Nat., Paris, 4ieme ser 9(2): 409-453.
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Cutler, E.B.	1966	Sipunculids of Madagascar. Cah. ORSTOM Ocean. 3: 50-xx.
Dahdouh-Guebas, F.	1994	Kenyan Mangrove Crabs: Feeding ecology and behavioural ecology of some selected species
Dance, S.P.	1974	The encyclopedia of shells. Blanford Press
Dawson, C.E & J.E. Randall	1975	Notes on Indo-Pacific Pipefishes (Pisces: Syngnathidae) with description of two new species. Proceedings of the Biological Society of Washington. Vol. 88 (25):

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