ESA-Listed Species in Manda Bay, Lamu Archipelago, Kenya

Bibliography

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Table of Contents

Background & Scope

Manda Bay is located in the Lamu Archipelago, on the northern coast of Kenya. It is part of the Indian Ocean, home to diverse marine species. This bibliography focuses on literature regarding the presence of Endangered Species Act (ESA) listed species in Kenya's Manda Bay, Lamu Archipelago, and Kiunga Marine National Reserve. Although articles geographically related to the Kenyan coast are included, those that were specifically about species in Mombasa, the Tana River Delta, or the Kisite-Mpunguti Marine National Park were excluded. The literature review is intended as a reference resource for ESA staff of NOAA Fisheries' Office of Protected Resources, who will be writing an ESA consultation document, a biological opinion, for a company that is planning development of the Lamu Port Offshore Energy Development Park. The timeframe of the articles range from 1995 – 2020. ESA-listed species that may be in the area include coral, fish, sea turtles, and marine mammals. Dugongs were not included as they are under the jurisdiction of the U.S. Fish and Wildlife Service. The bibliography is divided into five sections: corals, fish, sea turtles, marine mammals, and general.

Section I – Corals

Section one is intended to provide articles about ESA-listed coral species in the area. These include the genera: Acropora; Montipora; Pavona; Seriatopora.

Section II – Fish

Section two is intended to provide articles about ESA-listed fish in the area. These include: African coelacanth; narrow, green, and largetooth sawfish; giant manta ray; oceanic whitetip shark; scalloped hammerhead shark.

Section III – Sea Turtles

Section three is intended to provide articles about ESA-listed sea turtles in the area. These include: loggerhead; leatherback; green; hawksbill; olive ridley.

Section IV – Marine Mammals

Section four is intended to provide articles about ESA-listed marine mammals in the area. These include: blue; sei; fin; sperm; southern right.

Section V – General

Section five is intended to provide articles that discuss marine biodiversity and conservation in the area.

Sources Reviewed

The following databases were used to identify sources: Clarivate Analytics' Web of Science: Science Citation Index Expanded and Social Science Index; Digital Science's Dimensions; ProQuest's Science and Technology, including Aquatic Science Fisheries Abstracts; JSTOR; EBSCO's Academic Search Complete and Environment Complete; NOAA's Institutional Repository; the Biodiversity Heritage Library; BioOne Complete; and Google Scholar; and OceanDocs.org.

Section I: Corals

Church, J., & Obura, D. O. (2004). *Sustaining Coral Reef Ecosystems and Their Fisheries in the Kiunga Marine National Reserve, Lamu, Kenya.* Paper presented at the 10th International Coral Reef Symposium, Okinawa, Japan. Retrieved from http://hdl.handle.net/1834/7034

Coral reefs in the Kiunga Marine National Reserve (KMNR) (40o 07' E, 2o 00' S) are located in a transition ecotone between the warmer East African coral reef bioregion to the south, and colder waters of the Somali Current to the north. The reefs have been monitored annually from 1998 to the present, documenting a range of ecosystem changes from large and small scale threats. Reefs in the area suffered ˜60% loss of coral cover due to mass bleaching in the 1998 El Niño event, and 25-40% loss of coral species at individual site levels. Recovery of coral community structure has been variable, with some reefs showing strong recovery, while others have declined further. A harmful algal bloom and coral disease in early 2002 further impacted these reefs, causing mass mortalities of fish and coral, and failure of coral recruitment in that year. Fishing impacts to the reserve are high, with a strong south-north decline in fish density due to easier access to the migrant and large fishing communities to the south of the reserve. Responsibility for management of the KMNR falls under multiple institutions, including the Kenya Wildlife Service, Fisheries and Forestry Departments, and the local council. Overlapping mandates, unclear relationships, limited information and understanding, and lack of resources have hampered effective management. The monitoring programme reported here is one aspect of new collaborative appro aches to coral reef and fisheries management, and has focused on improving the information and understanding of the biological and resource systems of the area. The ecosystem trends induced by larger scale threats and the south-north fish resource gradient caused by local use patterns will be analyzed in an attempt to develop sustainable management practices for the reserve.

Cinner, J. E., Huchery, C., Darling, E. S., Humphries, A. T., Graham, N. A. J., Hicks, C. C., . . . McClanahan, T. R. (2013). Evaluating Social and Ecological Vulnerability of Coral Reef Fisheries to Climate Change. *Plos One, 8*(9), e74321. https://doi.org/10.1371/journal.pone.0074321

There is an increasing need to evaluate the links between the social and ecological dimensions of human vulnerability to climate change. We use an empirical case study of 12 coastal communities and associated coral reefs in Kenya to assess and compare five key ecological and social components of the vulnerability of coastal social-ecological systems to temperature induced coral mortality [specifically: 1) environmental exposure; 2) ecological sensitivity; 3) ecological recovery potential; 4) social sensitivity; and 5) social adaptive capacity]. We examined whether ecological components of vulnerability varied between government operated no-take marine reserves, community-based reserves, and openly fished areas. Overall, fished sites were marginally more vulnerable than community-based and government marine reserves. Social sensitivity was indicated by the occupational composition of each community, including the importance of fishing relative to other occupations, as well as the susceptibility of different fishing gears to the effects of coral bleaching on target fish species. Key components of social adaptive capacity varied considerably between the communities. Together, these results show that different communities have relative strengths and weaknesses in terms of social-ecological vulnerability to climate change.

Jerker, T. (2002). Coral Recruitment Following a Mass Mortality Event. *Ambio, 31*(7/8), 551-557. https://doi.org/10.1579/0044-7447-31.7.551

Coral recruitment, following the coral bleaching episode in 1998, was studied on the Kenyan coast. Scleractinian recruits representing 31 genera from 13 families were recorded in 2001, the dominant families at all sites being the Pocilloporidae, Poritidae, and Faviidae. The highest diversity and density of scleractinian recruits was observed at a site located within a marine park, with 11 families, 20 genera and 21.4 recruits per m2, while an unprotected site and sites with higher sediment input showed recruit densities under five. Survivorship was generally higher in massive than in branching genera. The diversity in the recruit population has decreased compared to pre-bleaching levels, while no significant change in density was recorded. Growth rates in recruits were consistent between sites and time of year, with an average growth rate of 0.117 mm2 mm-2 monW1, with variation between species. The fastest growing genera were Echinopora, Acropora, Pocillopora, and Porites. With the exception of Montipora, the growth rate of surviving pre-bleaching colonies was lower and exhibited greater variability between taxa and sites than among recruits.

Karisa, J. F., Kaunda-Arara, B., & Obura, D. (2008). Spatial and Temporal Variation in Coral Recruitment and Mortality in Coastal Kenya. In *Ten Years after Bleaching - Facing the Consequences of Climate Change in the Indian Ocean. Cordio Status Report 2008.* D. O. Obura, J. Tamelander, & O. Linden (Eds.), (pp. 223-234). Mombasa, Kenya: Coastal Oceans Research and Development in the Indian Ocean/Sida-SAREC Retrieved from http://hdl.handle.net/1834/7777

Measuring recruitment patterns and mortality of corals is important for understanding mechanisms that regulate their populations and mediate species coexistence. However, there is limited data on coral recruitment dynamics in Eastern Africa and much of the WIO. We studied spatial and temporal patterns of coral recruitment and mortality in four lagoonal reefs in Kenya. The objectives of the study were to compare coral recruit densities and juvenile mortality between sites, months, seasons and years. Twelve 1m 2 permanent quadrats were sampled for the variables at each site on a monthly basis from February 2006 to June 2007. Recruit density in the protected Mombasa Marine Park was significantly higher (7.45 recruits/ m2) than the other sites that are not protected. Recruit density was higher in SEM (Southeast Monsoon) than in NEM (Northeast Monsoon) seasons in both years with 2006 having higher recruitment than 2007. A total of 16 genera were recorded with Mombasa Marine Park having the highest number of genera (13) while a non protected site Kanamai had a significantly lower density (3.52 recruits/m2) with a low genera number (8). Other non-protected sites (Nyali and Vipingo) had intermediate recruit densities. Dominating genera were Favia, Porites, Favites, Pocillopora and Pavona in their order of overall abundance. Coral genera exhibited site specific abundance and mortality rates with Pocillopora having high abundance in Nyali (3.46 recruits/m2) and high mortality rate in Vipingo (85%). Benthic cover was dominated by Hard coral, turf algae, sand and rubble in all the sites. There was significant variation in seawater temperature levels with Kanamai recording the highest mean temperature (27.830C), temperature range (12.27) and also recorded the highest maximum temperature (36.230C). These findings suggest that there is spatial and temporal variation in recruit density, genera richness and survival of coral genera. Results also indicate that area protection and sea-water temperature influence recruitment between habitats but benthic substrate characteristics influence recruitment within a habitat.

Karisa, J. F., Obura, D. O., & Chen, C. A. (2020). Spatial Heterogeneity of Coral Reef Benthic Communities in Kenya. *Plos One, 15*(8), e0237397. https://doi.org/10.1371/journal.pone.0237397

Spatial patterns of coral reef benthic communities vary across a range of broad-scale biogeographical levels to fine-scale local habitat conditions. This study described spatial patterns of coral reef benthic communities spanning across the 536-km coast of Kenya. Thirty-eight reef sites representing different geographical zones within an array of habitats and management levels were assessed by benthic cover, coral genera and coral colony size classes. Three geographical zones were identified along the latitudinal gradient based on their benthic community composition. Hard coral dominated the three zones with highest cover in the south and Porites being the most abundant genus. Almost all 15 benthic variables differed significantly between geographical zones. The interaction of habitat factors and management levels created a localised pattern within each zone. Four habitats were identified based on their similarity in benthic community composition; 1. Deep-Exposed Patch reef in Reserve areas (DEPR), 2. Deep-Exposed Fringing reefs in Unprotected areas (DEFU), 3. Shallow Fringing and Lagoon reefs in Protected and Reserve areas (SFLPR) and 4. Shallow Patch and Channel reefs (SPC). DEPR was found in the north zone only and its benthic community was predominantly crustose coralline algae. DEFU was found in central and south zones mainly dominated by soft corals, Acropora, Montipora, juvenile corals and small colonies of adult corals. SFLPR was dominated by macroalgae and turf algae and was found in north and central zones. SPC was found across all geographical zones with a benthic community dominated by hard corals of mostly large colonies of Porites and Echinopora. The north zone exhibits habitat types that support resistance properties, the south supports recovery processes and central zone acts as an ecological corridor between zones. Identifying habitats with different roles in reef resilience is useful information for marine spatial planning and supports the process of designing effective marine protected areas.

Mwachireya, S. A., Carreiro-Silva, M., Hartwick, B. E., & McClanahan, T. R. (2018). Terrestrial Discharge Influences Microbioerosion and Microbioeroder Community Structure in Coral Reefs. *African Journal of Marine Science, 40*(1), 25-42. https://doi.org/10.2989/1814232x.2018.1435424

Microbioerosion rates and microbioeroder community structure were studied in four Kenyan protected coral-reef lagoons using shell fragments of Tridacna giant clams to determine their response to the influence of terrestrial run-off. Fourteen different microbioeroder traces from seven cyanobacteria, three green algae and four fungi species were identified. The river discharge-impacted reef and 'pristine' reef showed similar composition but higher microbioeroder abundance and total cyanobacteria- and chlorophyte-bioeroded areas when compared with the other study reefs. Cyanobacteria dominated during the north-east monsoon (NEM) relative to the south-east monsoon (SEM) season, with algae and cyanobacteria being major microbioeroders in the river-impacted and pristine reefs. The rate of microbioerosion varied between 4.3 g CaCO3 m(-2) y(-1) (SEM) and 134.7 g CaCO3 m(-2) y(-1) (NEM), and was highest in the river-impacted reef (127.6 g CaCO3 m(-2) y(-1)), which was almost double that in the pristine reef (69.5 g CaCO3 m(-2) y(-1)) and the mangrove-fringed reef (56.2 g CaCO3 m(-2) y(-1)). The microbioerosion rates measured in this study may not be high enough to cause concern with regard to the health and net carbonate production of Kenya's coral reefs. Nevertheless, predicted increases in the frequency and severity of stresses related to global climate change (e.g. increased sea surface temperature, acidification), as well as interactions with local disturbances and their influence on bioerosion, may be increasingly important in the future.

Nguu, J., Obura, D., Murunga, M., & Fulanda, B. (2018). Review of Coral Classification Status: A Case Study of Kiunga Marine National Reserve, North Coast Kenya. *Kenya Aquatica, 4*(1), 29-37. Retrieved from http://41.89.141.8/kmfri/handle/123456789/498

Coral classification is a dynamic science which requires regular updates on the species name changes, distribution, threats of extinction and the methods used to detect these changes. Use of a single method of classification either morphological or genetic is not sufficient to confirm the changes. A review of Coral classification for the Kiunga Marine National Reserve (KMNR) in north coast Kenya was conducted during October, 2014 and July 2015 to ascertain the current status and assess the coverage on phylogenetic literature; IUCN Red List status and reference to threats facing the species which are local or elsewhere. Results from this study showed that Corals from Kiunga Marine National Park were well covered in all aspects of phylogenetic literature at 89.4% making it possible to adequately group them to their IUCN Red list categories. However, the analysis detected a group of species which had not been assigned into any status on the IUCN Red list classification, representing 8.6%. With data and information on such omissions, the species could be faced with several threats hence the need to conduct further studies and analysis focusing on acquiring comprehensive data and information for clear establishment of updated status of the taxonomy of Corals so as to correctly label them in the groups.

Obura, D. (2002). Status of Coral Reefs in Kiunga Marine Reserve, Kenya. In *Coral Degradation in the Indian Ocean: Status Report 2002.* O. Linden, D. Souter, D. Wilhelmsson, & D. Obura (Eds.), (pp. 47-54). Kalmar, Sweden: CORDIO Retrieved from http://www.reefbase.org/resource_center/publication/main.aspx?refid=19968

Monitoring of coral reefs in Kenya focuses on two main parts of the coast, representing the two regions of the coastline dominated by coral reefs. The southern coast of Kenya, from Malindi to the border with Tanzania is dominated by a near-continuous fringing reef, and monitoring focuses on lagoon patch reefs in protected and unprotected sites. This monitoring effort is conducted by the Wildlife Conservation Society (Coral Reef Conservation Project), together with the Kenya Wildlife Service and the Kenya Marine and Fisheries Research Institute (McClanahan, 1992; McClanahan & Obura, 1995), beginning in approximately 1985 and continuing until the present. The northern coast of Kenya contains more discontinuous reefs, in a system of barrier islands, mangrove and seagrass beds, the northern portion of which is contained in a marine reserve (the Kiunga Marine Reserve) that allows fisheries extraction. Coral reef monitoring in this region is coordinated by CORDIO and WWF, also in partnership with KWS, KMFRI, and recently, the Fisheries Department, and extends from 1998 to the present (Obura et al., 1998; Obura & Church, in prep). Components of this montoring effort are also designed to include local fishermen.

Obura, D. (2008). Scleractinian Coral Fauna of the Western Indian Ocean. In *Ten Years after Bleaching - Facing the Consequences of Climate Change in the Indian Ocean. Cordio Status Report 2008.* D. O. Obura, J. Tamelander, & O. Linden (Eds.), (pp. 139-148). Mombasa, Kenya: Sida-SAREC Retrieved from http://hdl.handle.net/1834/9007

Scleractinian coral species surveys were conducted at 10 sites in the western Indian Ocean, between 2002 and 2006. Each site varied from approximately 50-200 km in extent and was sampled with from 7 to 27 dives. Accumulation curves based on successive samples at each site were used to construct logarithmic regression curves, which provide estimated species numbers at each site at an arbitrary

value of 30 samples per site, assumed to reflect the total number of species. The highest diversity of corals was found in southern Tanzania to northern Mozambique (from Mafia Island to Pemba town), with 280-320 species estimated per site. Species diversity was lower in the central Indian Ocean islands (140-240 species) and declined steadily to a minimum in northern Kenya (150 species). These patterns are consistent with the central coast (around 10oS in Tanzania/Mozambique) accumulating and retaining species due to the South Equatorial Current (SEC) and mixing/reversing currents locally, respectively. The islands may have restricted diversity due to low area but nevertheless be stepping stones to the East African mainland coast. Lower diversity northwards into Kenya may reflect distance and low dispersal from the center of diversity at 10oS, and poorer conditions due to the Somali Current influence in the north. Observer effects and unclear taxonomy of scleractinian corals may significantly affect the dataset, as may faunal changes due to bleaching or other impacts at individual sites during the course of the study. Finally, it is likely that the diversity gradient northwards into Kenya is replicated southwards into southern Mozambique and South Africa, providing a means to test latitudinal changes in diversity and species distributions.

Obura, D. (2012). The Diversity and Biogeography of Western Indian Ocean Reef-Building Corals. *Plos One, 7*(9), e45013. https://doi.org/10.1371/journal.pone.0045013

This study assesses the biogeographic classification of the Western Indian Ocean (WIO) on the basis of the species diversity and distribution of reef-building corals. Twenty one locations were sampled between 2002 and 2011. Presence/absence of scleractinian corals was noted on SCUBA, with the aid of underwater digital photographs and reference publications for species identification. Sampling effort varied from 7 to 37 samples per location, with 15 to 45 minutes per dive allocated to species observations, depending on the logistics on each trip. Species presence/absence was analyzed using the Bray-Curtis similarity coefficient, followed by cluster analysis and multi-dimensional scaling. Total (asymptotic) species number per location was estimated using the Michaelis-Menten equation. Three hundred and sixty nine coral species were named with stable identifications and used for analysis. At the location level, estimated maximum species richness ranged from 297 (Nacala, Mozambique) to 174 (Farquhar, Seychelles). Locations in the northern Mozambique Channel had the highest diversity and similarity, forming a core region defined by its unique oceanography of variable meso-scale eddies that confer high connectivity within this region. A distinction between mainland and island fauna was not found; instead, diversity decreased radially from the northern Mozambique Channel. The Chagos archipelago was closely related to the northern Mozambique Channel region, and analysis of hard coral data in the IUCN Red List found Chagos to be more closely related to the WIO than to the Maldives, India and Sri Lanka. Diversity patterns were consistent with primary oceanographic drivers in the WIO, reflecting inflow of the South Equatorial Current, maintenance of high diversity in the northern Mozambique Channel, and export from this central region to the north and south, and to the Seychelles and Mascarene islands.

Obura, D., Chuang, Y. Y., Olendo, M., Amiyo, N., Church, J., & Chen, C. A. (2007). Relict Siderastrea Savignyana (Scleractinia : Siderastreidae) in the Kiunga Marine National Reserve, Kenya. *Zoological Studies, 46*(4), 427-427. Retrieved from http://zoolstud.sinica.edu.tw/Journals/46.4/427.html

Siderastrea savignyana (Scleractinia: Siderastreidae) is the only species of genus Siderastrea assumed to be distributed across the entire Indo-West Pacific (Veron 2000). However, its validity as a species

remains highly equivocal. In the course of efforts to establish the biogeographic distribution and phylogenetic validity of S. savignyana, we discovered 2 small populations in the Kiunga Marine National Reserve (KMNR; 1°49.730'S, 41°26.685'E), northern Kenya. Both populations are located on sheltered shallow patch reefs in channels leading into extensive mangrove systems, and at 0-3 m depth at mean low water. The colony size varied from < 10 cm mounds to large healthy, massive, micro-atoll colonies of up to 2 m in diameter (Fig. 1).

Obura, D., Souter, D., & Linden, O. (2005). *Kenya - Coral Reef Resilience Studies*. Retrieved from http://hdl.handle.net/1834/6896

Activities supported by CORDIO in Kenya started in 1999, focusing on a long term coral reef monitoring programme in the Kiunga Marine Reserve to track recovery of reefs from the 1998 El Nino coral bleaching event (Obura, 1999). In addition, a range of biological studies were supported (Obura et al., 2000), including studies on temperature/UV interactions, benthic community structure, coral recruitment and bleaching, coral/zooxanthellae dynamics, macro- and micro-algal community structure and bio-erosion, many of them led by scientists from the Kenya Marine and Fisheries Research Institute. Community-based participatory monitoring activities started in 1997 in the Diani-Chale area of southern Kenya were also added to CORDIO's portfolio, to facilitate raising awareness among resource users of the need for management, and to trial new techniques for generating data on coral reef status where resources and technical staff are limited. See reports in Linden and Sporrong (1999), Souter et al. (2000), Linden et al. (2002). At the end of 2004/beginning of 2005, CORDIO activities in Kenya included several long term monitoring initiatives and associated research projects to improve interpretation of the monitoring information. These are being integrated into a more unified structure to research the resilience of Kenya's reef ecosystems in relation to thermal stress and mass bleaching impacts caused by global warming. This report outlines how the various components of CORDIO's coral monitoring and research programme contribute to this overall structure of studying resilience.

Obura, D. O. (1999). Status Report Kenya. In *Coral Reef Degradation in the Indian Ocean: Status Reports and Project Presentations.* O. Linden & N. Sporrong (Eds.), (pp. 32-35): CORDIO, Stockholm (Sweden) Retrieved from http://www.cordio.org/reports.html

Kenya's coral reefs are divided between two main areas: the southern, almost-continuous fringing reef system from Malindi to Shimoni, and more broken up patch and fore reef slopes around the islands of the Bajuni Archipelago, from Lamu and northwards. In both areas, hard substrate patches with coral growth are interspersed between extensive seagrass and algal beds. Within these patches, coral cover is typically about 30%, with over 50 genera and up to 200 common species of coral recorded so far. Reef complexity and diversity is higher in the south and decreases northwards past Lamu due to increasing influence of the cold-water Somali current system. Bleaching was first noticed in Kenya in 1998, and then rose to unprecedented levels of 50-90% of the corals along the entire Kenya coast. Mortality from bleaching appeared to peak about mid-May, and subsequently some bleached corals recovered, while others continued to die up until October.

Visram, S., Mwaura, J., & Obura, D. O. (2008). Assessing Coral Community Recovery from Coral Bleaching by Recruitment in Two Reserves in Kenya. *Western Indian Ocean Journal of Marine Science, 6*(2), 199-205. Retrieved from http://hdl.handle.net/1834/8334

In 2003 and 2005, studies were carried out on the density of small coral colonies (<10 cm) on three reefs in the Mombasa Marine National Park and Reserve on the southern fringing reef system of Kenya, and on three reefs in the Kiunga Marine National Reserve in the north of the country. All the study sites were impacted by a major coral bleaching event in 1998. A total of 28 coral genera from 12 families were recorded, of which 17 genera were recorded on both northern and southern sites. Two or three genera of corals contributed 50-60% of all small colonies in both regions, with Porites, Coscinarea and Pocillopora the main contributors of small colonies in Kiunga, and Pocillopora being the most abundant genus of small corals in Mombasa in both years. The densities of small colonies were lowest at the northern sites, and small colonies of genera of corals that suffered from high bleaching and mortality during the El Niño Southern Oscillation in 1998 were less abundant in the north. These northern reefs are relatively isolated from sources of coral larvae from reefs in the south, and are seasonally influenced by nutrient-rich, cooler water due to the influence of the Somali Current and the northeast monsoon winds. The data presented here support our preliminary assessment that these northern reefs are less likely to recover by natural recruitment. These reefs are therefore more vulnerable to environmental perturbation such as the conditions that elicited coral bleaching on the study reefs in 1998.

Section II: Fish

Kaunda-Arara, B., Munga, C., Manyala, J., Kuguru, B., Igulu, M., Chande, M., . . . Ruwa, R. (2016). Spatial Variation in Benthopelagic Fish Assemblage Structure Along Coastal East Africa from Recent Bottom Trawl Surveys. *Regional Studies in Marine Science, 8*, 201-209. https://doi.org/10.1016/j.rsma.2016.04.001

The structure of benthopelagic fish assemblages of the continental shelves and upper slopes along coastal East Africa (Kenya and Tanzania) was studied based on data from bottom trawls during 2012. These surveys are the most recent since the historical bottom trawls conducted in the 70s and 80s along costal East Africa. The bottom trawls sampled fishes in 27 stations along the Kenyan coast using FV Vega, while in Tanzania 24 stations were sampled by MV Mafunzo. A total of 66 fish species in 43 families were trawled in Kenya, while 40 species belonging to 22 families were sampled in Tanzania in depth ranges of 10 m to 230 m. The highest fish biomass was in shallow (<50 m) areas for both Kenya (123.08 kg/km2) and Tanzania (49.17 kg/km2). Numerically dominant species in Kenyan trawls included the largehead hairtail, *Trichiurus lepturus* (21.44%), the filesnout grenadier, *Coelorhinchus denticulatus* (9.50%) and the orangefin ponyfish, *Photopectoralis bindus* (7.57%), while in Tanzania, the hipfin ponyfish, *Leiognathus leuciscus* (27.09%), sulphur goatfish, *Upeneus sulphureus* (19.56%) and the finstripe goatfish *U. taeniopterus* (12.05%) dominated the trawls. The nMDS analysis indicated the fish assemblages to be influenced by both depth and area for Kenya, and mostly area sampled for Tanzania, while multivariate Correspondence Anlysis (CA) provided characteristic species associated with depth and area for both Kenya and Tanzania. Results of rarefaction curves showed the highest species diversity occurring in Tanzanian shallow depths (>50 m) of the south coast and shallow and mid-depths (50–150 m) of north coast. The lowest species diversity was associated with Kenyan samples of north coast in the mid-depth (50–150 m) and deep (>150 m) waters. The dominant species in the trawls differed with those documented in the historical trawls of the 1970–1980s. The results provide a taxonomic database on the fish species off coastal East Africa useful for monitoring spatio-temporal changes in fish assemblages in the face of climate change effects and increasing exploitation levels.

Kiilu, B. K., Kaunda-Arara, B., Oddenyo, R. M., Thoya, P., & Njiru, J. M. (2019). Spatial Distribution, Seasonal Abundance and Exploitation Status of Shark Species in Kenyan Coastal Waters. *African Journal of Marine Science, 41*(2), 191-201. https://doi.org/10.2989/1814232X.2019.1624614

Efforts to conserve and manage shark populations are often hampered by a lack of basic data, such as species-specific landings and distribution ranges. We bridge this gap in coastal East Africa by providing data on the distributions, catch rates, morphometrics, and exploitation status of shark species in Kenyan coastal waters. Data were collected from artisanal fishers and from bycatch taken by shallow-water (10-50 m) prawn trawlers from Malindi-Ungwana Bay and demersal research trawlers (10-150-m depth) along the ~640-km coastline, over a 12-month period (June 2012 to May 2013). A total of 1893 individual sharks (representing 20 species and 11 families) were sampled from the artisanal fishery (n=1 610) and the trawlers (n=283). The demersal trawl bycatches were dominated by the African angelshark *Squatina africana* (2.39 kg h-1), shortnose spurdog shark *Squalus megalops* (1.48 kg h-1) and African spotted catshark *Holohalaelurus punctatus* (0.11 kg h-1). Catches of the scalloped hammerhead shark *Sphyrna lewini* (0.73 kg h-1), smooth hammerhead shark *Sphyrna zygaena* (0.60 kg h-1) and grey reef shark *Carcharhinus amblyrhynchos* (0.77 kg h-1) dominated in the prawn trawlers. Only a few species (*S. lewini, C. amblyrhynchos*, and blacktip reef shark *Carcharhinus melanopterus*) showed a coast-wide distribution in the artisanal fishery. Artisanal fishers harvested mostly immature specimens of *S. lewini*,

C. melanopterus and blacktip shark *Carcharhinus limbatus*, suggesting that the fishery might be unsustainable in the long-term. The Endangered *S. lewini* is the most vulnerable to overexploitation on the Kenyan coast, with most specimens landed (>90%) being below the size at maturity. Data are also presented on morphometric relationships and observed or estimated exploitation reference points (maximum observed length Lmax, asymptotic length $L\infty$, mean length at first maturity Lm, and optimum length Lopt) for the commonly landed species. A more comprehensive coast-wide National Plan of Action is recommended for the management of shark populations in Kenya.

Kiilu, B. K., & Ndegwa, S. (2013). *Shark Bycatch - Small Scale Tuna Fishery Interactions Along the Kenyan Coast.* Indian Ocean Tuna Commission Victoria Mahe, Seychelles. Retrieved from http://hdl.handle.net/1834/7747

In Kenya and to a great extent most parts of the WIO region, shark catches majorly occur as by-catch in artisanal tuna fisheries and prawn trawls, including sport fishing activities. However, the extent to which these various fisheries catch sharks is not known but may be significant. The species structure, distribution, catch rates and levels of fisheries-shark interactions are not well documented. This information is, however, necessary to assess exploitation levels of shark species and for setting regulatory, conservation and management frameworks. This study therefore aimed at filling this information gap. Data was collected from fisher landings at various sites along the Kenya coast and by observers on commercial and scientific trawl surveys. Landings at 5 beaches were inspected for 15 days per month for 12 months (August 2012 to July 2013). Specimens were identified to species and, sex, length and weight recorded for each shark landed or trawled as by-catch. Results indicate that the artisanal and the prawn trawl shark bycatch is dominated by Hammerhead sharks (*Sphyrna lewini*, 53.7%), Blacktip Reef shark (*Carcharhinus melanopterus*, 33.7%), and Grey Reef shark (*Carcharhinus amblyrhynchos*, 5.5%). Other species present in the catches in lower quantities (~7.1%) include *Carcharhinus falciformis, Carcharhinus longimanus, Carcharhinus brevipinna, Sphyrna zygaena, Stegostoma fasciatum.* Catch rates of species show spatial and seasonal variation in abundance with higher catches in Kenya's north coast. Morphometrics of the dominant species are included, and size frequency distributions show mostly juveniles in the catches. There is need to continuously monitor the distribution and abundance of sharks, including shark-fishery interactions in the WIO region for purposes of conservation.

Oddenyo, R. M., Mueni, E., Kiilu, B., Wambiji, N., Abunge, C., Kodia, M. A., . . . Mwasi, L. (2018). *Kenya Sharks Baseline Assessment Report for the National Plan of Action for the Conservation and Management of Sharks.* Kenya Fisheries Service Retrieved from https://www.iotc.org/documents/WPEB/15/11

Sharks and rays form part of Kenya's fish landings for a long period with records dating back to the 1980s (Marshall, 1997). Out of a total of 45 species of sharks and rays that have a geographic range including Kenyan waters and have been assessed by the International Union for Conservation of Nature (IUCN), 19 are classified as threatened globally in the Red List (IUCN, 2018) amounting to ~ 40% while 9 species representing ~20% are categorised as near threatened. The remainder of species assessed and whose distribution spans Kenyan waters are either data deficient or of least concern in the IUCN Red list contributing to ~25% and ~15% of sharks and rays assessed in the country (IUCN, 2018). These findings are of much concern, and require focused interventions. The process of drafting the National Plan of Action for Sharks and Rays (NPOA-Sharks and Rays) was initiated by the State Department of Fisheries

(SDF) in 2014 to comply with the guiding principles established in the International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks), in line with the FAO Technical Guidelines for Responsible Fisheries (FAO, 2000). In 2017, the Kenya Fisheries Service (KeFS, formerly the SDF) in collaboration with the Wildlife Conservation Society (WCS) set out to complete this process. Kenya has now developed a baseline assessment report, which is an important first step towards the development of a NPOA-Sharks and Rays for Kenya. This report has been compiled by team of experts and collaborating organizations with the objective of creating a first step towards developing Kenya's NPOA-Sharks and Rays.

Omondi, E. (1995). Cetaceans and Fisheries in Kenya Coastal Waters: A Preliminary Study. In *Coastal Systems and Sustainable Development in Africa: Proceedings of a Unesco Regional Seminar on Human Impacts on Coastal Ecosystems, Their Response and Management Problems, Rosta, Nairobi, 5-9 April 1993.* (pp. 124-138): Kenya Marine and Fisheries Research Institute (KMFRI) Retrieved from http://hdl.handle.net/1834/7118

Of all marine resources characteristic of the Kenyan coast, marine mammals are least studied singly or in association with other resources. In this paper, available records on cetacean catches by district between 1978-1991 inclusive were used to assess the status and trend of their fishery, distribution, and interaction with sharks, clupeids and tuna landings. Spartial 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 (X) 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 lime. 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 net highly significant at $P < 0.05$ (4.84). The possible impacts of other human activities on the cetacean population are discussed. Priority areas in marine mammal studies and management strategies vital in ensuring a balanced co-existence of the coastal populations and ecosystems are also discussed.

Section III: Sea Turtles

Bourjea, J., Nel, R., Jiddawi, N. S., Koonjul, M. S., & Bianchi, G. (2008). Sea Turtle Bycatch in the West Indian Ocean: Review, Recommendations and Research Priorities. *West Indian Ocean Journal of Marine Science, 7*(2), 137-150. Retrieved from https://www.bmis-bycatch.org/references/74yqgi9j

Within the framework of the FAO project GCP/INT/919/JPN and a review of published or available data, the relative importance of fishery-related sea turtle mortality in the West Indian Ocean region was assessed for Kenya, Madagascar, Mauritius, Maldives, Mozambique, Seychelles, Somalia, South Africa, Reunion, Tanzania and Yemen. Three fisheries were identified to significantly impact marine turtles: gillnetting, prawn/shrimp trawling and longlining, but it clearly appears that there is a global lack of published and reliable information regarding marine turtle population assessments and interaction with fisheries in the WIO. However, countries such as Seychelles, South Africa and La Réunion (France) already collect various and reliable data that allow an assessment of their marine turtle populations and the level of interactions related to open sea fisheries (mainly longline and purse seine). This allowed the identification of recommendations and research priorities for this region but also demonstrated that such recommendations could only by implemented through the use of appropriate policy measures, adequately designed and developed in cooperation with fishermen, stakeholders, scientists and managers in order to (a) be able to apply the measures, (b) be sure to have the capacity of implementation and (c) be able to provide follow up over time.

Jensen, M. P., Dalleau, M., Gaspar, P., Lalire, M., Jean, C., Ciccione, S., . . . Bourjea, J. (2020). Seascape Genetics and the Spatial Ecology of Juvenile Green Turtles. *Genes, 11*(3), 278. https://doi.org/10.3390/genes11030278

Understanding how ocean currents impact the distribution and connectivity of marine species, provides vital information for the effective conservation management of migratory marine animals. Here, we used a combination of molecular genetics and ocean drift simulations to investigate the spatial ecology of juvenile green turtle (*Chelonia mydas*) developmental habitats, and assess the role of ocean currents in driving the dispersal of green turtle hatchlings. We analyzed mitochondrial (mt)DNA sequenced from 358 juvenile green turtles, and from eight developmental areas located throughout the Southwest Indian Ocean (SWIO). A mixed stock analysis (MSA) was applied to estimate the level of connectivity between developmental sites and published genetic data from 38 known genetic stocks. The MSA showed that the juvenile turtles at all sites originated almost exclusively from the three known SWIO stocks, with a clear shift in stock contributions between sites in the South and Central Areas. The results from the genetic analysis could largely be explained by regional current patterns, as shown by the results of passive numerical drift simulations linking breeding sites to developmental areas utilized by juvenile green turtles. Integrating genetic and oceanographic data helps researchers to better understand how marine species interact with ocean currents at different stages of their lifecycle, and provides the scientific basis for effective conservation management.

Kenya Wildlife Service, & Kenya Sea Turtle Conservation Committee. (2014). *Kenya National Report 2014.* Retrieved from https://www.cms.int/iosea-turtles/en/document/kenya-national-report-2014

Five of the seven extant sea turtle species are reported to occur within Kenyan waters. These include green, hawksbill, olive ridley, loggerhead and leatherback turtles. The green turtle *(Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*) and olive ridley (*Lepidochelys olivacea*) are the most common and known to nest in Kenya (Frazier 1975; Wamukoya et al. 1997; Nzuki 2005a). The green turtle is numerically the most important nesting species (Okemwa et al. 2004). The loggerhead (*Caretta caretta*), and the leatherback (*Dermochelys coriacea*) are rare, although past records indicate that they used to occur within Kenyan waters (Frazier 1975; Nzuki 2005a). While green turtles nest throughout the Kenyan coast, hawksbill turtles are reported to nest predominantly in Kiunga, Malindi, Watamu and Funzi; olive ridleys have been reported to nest in the Kiunga, Malindi, Watamu and Mombasa regions (Nzuki et al. 2005a). Fisheries (both artisanal and commercial fisheries) are thought to pose the most important threat to sea turtles (Okemwa et al. 2004). In the mid-1990s, it was estimated that between 500 and 1000 turtles were caught annually as bycatch in trawlers (Wamukoya et al. 1995), while up to 10,000 turtles are caught annually in artisanal gill nets (Wamukota 2005); 54 to 75% of these turtles are slaughtered or traded by the fishermen (Nzuki 2004). Another major threat includes poaching (10 to 50%) of nesting females (for meat and oil) and their nests (eggs), which is exacerbated by poor law enforcement, poverty and trade of turtle products on the black market (Nzuki 2004; Okemwa et al. 2004; Nzuki 2005b). Illegal trade in turtle products is rampant in Kenya. Meat (preferably from green turtles) and oil are the most important products traded. Eggs, carapaces and stuffed turtles (particularly hawksbill turtles) are also items of trade. International trade in turtle products has been reported and this may be facilitated primarily by migratory fishermen, which is common in the Western Indian Ocean Region. Coastal development, often associated with tourism, has resulted in the direct and indirect destruction of turtle habitats (Okemwa et al. 2004; Wamukota and Okemwa 2008). Non compliance to the official setback line regulations (60 m above the high water mark) is a major threat (SOC, Okemwa et al. 2005a). Natural predators include ghost crabs, mongooses, monitor lizards, hyenas, genets, porcupines, hedgehogs and birds of prey (Okemwa et al. 2005a; Weru 2005). Kenya has so far enacted legislation which particularly protects sea turtles as endangered species. This may cited from the Wildlife Conservation and Management Acts (Cap 376) and the Fisheries Act (Cap 378). A sea turtle Nation Conservation and Management Strategy has been developed and launched and is now being implemented. Additionally, an ICZM policy, Action Plan and a Shoreline Management strategy have been developed and implementation strategies are now being developed.

Mueni, E. M., Nzuki, S., & Okemwa, G. M. (2003). *Conservation and Management of Sea Turtles in Kenya.* Paper presented at the Twenty-third Annual Symposium on Sea Turtle Biology and Conservation, Kuala Lumpur, Malaysia. Retrieved from https://repository.library.noaa.gov/view/noaa/4418

This paper summarizes turtle conservation and management activities spanning a five-year period (1997-2002) characterized by increased reports of incidents of turtle mortality, poaching and illegal trade in turtle products (oil, meat and eggs) which constitute the major challenges to the realization of sustainable populations of marine turtles in Kenya. Within this period, the Kenya Sea Turtle Conservation Committee (KESCOM) has evolved from a committee to become the national body coordinating turtle conservation action in Kenya guided by three broad objectives (conducting

research, awareness and monitoring activities,education and capacity building programs and enhancing community participation), which are designed to respond to the above challenges.

Nzuki, S., Mulwa, E. M., & Okemwa, G. M. (2003). *Sea Turtle Conservation and Management in Kenya.* Paper presented at the Twenty-third Annual Symposium on Sea Turtle Biology and Conservation, Kuala Lumpur, Malaysia. Retrieved from https://repository.library.noaa.gov/view/noaa/4418

The Kenya Sea Turtle Conservation Committee (KESCOM) was established in 1993 out of a necessity to address the plight of five marine turtle species (green, hawksbill, olive ridley, loggerhead and the leatherback) occurring in Kenya, and represents a national integrated approach contributing towards global efforts in turtle conservation. This followed increased incidents of turtle mortality (Wamukoya, 1997) mainly occasioned by fishing activities and reportedly declining populations (Wamukoya, 1997, Frazier, 1975) within the Western Indian Ocean region as a whole. The committee sought to specifically address the problems of illegal poaching of turtle eggs and meat and a burgeoning list of threats posed by the growth of the tourism industry. There have also been attempts to institute measures, which can withstand gaps in national legislation (Cap 376 of the Wildlife Act and Cap378 of the Fisheries Act) mainly through community and stakeholder involvement and participation in the conservation process. The guiding objectives relate to conservation and management driven research and monitoring, capacity building and awareness, community participation and building of networks and collaborative strategies (KESCOM, 1999).

Obare, F. D. (2019). Anthropogenic and Biophysical Factors Influencing the Nesting Choice of the Green Turtle (Chelonia Mydas, Linnaeus, 1759) Along the Kenyan Coast. In *College of Biological and Physical Sciences* (Vol. Master of Science). Nairobi, Kenya: University of Nairobi. Retrieved from http://erepository.uonbi.ac.ke/handle/11295/152832

The Green turtle *Chelonia mydas Linnaeus*, 1759 accounts for highest number of sea turtles that nest along Kenya's coastline where there are varying biophysical and anthropogenic factors influencing nest sites that they select to lay their eggs. This study was conducted between February and November, 2016 and it was therefore, designed to establish the relationship between number of nests of C. mydas with biophysical and anthropogenic variables. A multiple regression model was employed to assess the factors that contribute to higher number of nest. The multiple regression model did not significantly predict the number of nest, $F(8, 22) = 0.294$, $p > 0.05$, $R = 0.311$. All the variables: vegetation cover, organic matter content, beach width, slope of the beach, number of people, debris weight, sea defence barrier and beach font lighting did not add statistically significantly to the prediction, $p > 0.05$. However, there was decrease in number of nests with increase of organic matter content, $b = -8.312$, sea defence height $b = -3.155$ and beach front lighting $b = -2.154$. Anthropogenic factors thus, had the greatest negative impact on number of nests. Nonetheless, nesting of *C. mydas* was observed to occur across different spectrum of human disturbance. Some of the uninhabited beaches in Lamu County had high number of annual nests despite high amount of debris per 100m-2 brought in by waves from other regions, for example, Kitangakikuu had 7kg, KSV had 3kg and Mwanabule had 3kg. The average debris weight was 1.90kg 100 m-2. It is therefore recommend that existing laws should be enforced to control beach development along the Kenyan coast to protect existing nesting areas and long term monitoring should to be put in place to evaluate the impact of human disturbance on the number of nests as a management tools in conservation efforts of C. mydas.

Obare, F. D., Chira, R., Sigana, D., & Wamukota, A. (2019). Biophysical Factors Influencing the Choice of Nesting Sites by the Green Turtle (*Chelonia mydas*) on the Kenyan Coast. *Western Indian Ocean Journal of Marine Science, 18*(2). https://doi.org/10.4314/wiojms.v18i2.5

The green turtle (*Chelonia mydas*) is the most common sea turtle nesting along Kenya's coastline. Varying biophysical factors influence choice of nesting sites where eggs are laid. This study was conducted between February and November 2016 and was designed to establish the relationship between numbers of *C. mydas* nests on the beach and biophysical variables such as vegetation cover, organic matter content (OMC), beach width, and beach slope. Multiple regression analysis was employed to assess the factors that contribute to the number of *C. mydas* nests on a beach. This analysis did not allow prediction of the number of nests in a statistically significant way ($F(4, 26) = 0.094$, $p > 0.05$, $R = 0.120$). However, there was a decrease in the number of nests with increased vegetation cover ($b = -0.013$), OMC ($b = -8.114$), beach width ($b = -0.089$) and slope of the beach ($b = -0.352$). Approximately 70% of nests occurred on beaches with medium and fine sand. Beaches with intense human activities were associated with high OMC which significantly affected the number of nests on the beach. It is therefore recommended that existing laws should be enforced to control beach development and human activities along the Kenyan coast to protect nest sites. Additionally, long term monitoring should be put in place to evaluate the impact of human disturbance on the favourable biophysical factors influencing the number of nests on a beach, as a management tool in the conservation of *C. mydas*.

Okemwa, G. M., Ndirangu, S., Ong'anda, H. O., & Mueni, E. M. (2005). *A Preliminary Characterization of Sea Turtle Nesting Beaches Along the Kenyan Coast.* Paper presented at the Twenty-fifth Annual Symposium on Sea Turtle Biology and Conservation, Savannah, Georgia, USA. Retrieved from https://repository.library.noaa.gov/view/noaa/4414

The challenges sea turtles face from human activities are enormous as they impact every stage of their life cycle, from loss of nesting beach and foraging habitats to fishing related mortalities. The influx of coastal developments is one of the greatest problems facing Kenya's coastal beaches and is an important conservation issue. Threats to nesting beaches emanate from the construction of sea walls and other armoring structures, increased human presence and presence of recreational or beach equipment and beach erosion. A rapid ground survey was undertaken along the Southcoast, Mombasa, Kilifi, Watamu, Malindi, Robinson Island and Lamu areas to profile sea turtle nesting beaches with the aim of assessing the current status the beaches and developing a baseline GIS database. A spatial index of the following physical parameters were taken: GPS location, beach slope, sand grain size, presence and type of armoring structures, their length and distance from the high water mark, human presence and fishing activity, predominant threats, presence of predators and vegetation. Semi-structured interviews with local fishermen and residents revealed evidence of nesting habitat loss particularly in areas with high beachfront development and human activity in the Southcoast, Mombasa and Kilifi. The database will be an important reference tool for research and monitoring of Kenya's turtle nesting beaches.

Okemwa, G. M., Nzuki, S., & Mueni, E. M. (2004). The Status and Conservation of Sea Turtles in Kenya. *Marine Turtle Newsletter*(105), 1-6. Retrieved from http://hdl.handle.net/1834/7717

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. The 200km of beach land available for sea turtle nesting is however under critical threat of erosion and pollution (UNEP 1998). The Kenya government has put in place legislation to protect sea turtles i.e., the Wildlife Act (Cap 376) and the Fisheries Industry Act (Cap 378). The laws prohibit hunting, removing, holding, moving and trafficking sea turtles and their products whether dead or alive. However, there is no legislation protecting key nesting and foraging habitats utilized by sea turtles except for those falling within Marine Protected Areas (MPAs). As a result, poaching of sea turtles continues unabated compounded by poor enforcement due to a lack of personnel and facilities. To address the plight of marine turtles, the Kenya Sea Turtle Conservation Committee (KESCOM) was established in 1993 under the patronage of various government institutions: Kenya Wildlife Services (KWS), Fisheries Department (FD), Kenya Marine and Fisheries Research Institute (KMFRI), Coast Development Authority (CDA) and National Museums of Kenya (NMK) and Wildlife Clubs of Kenya. Various non-government organizations, WWF-Kiunga, Baobab Trust, Watamu Turtle Watch (WTW) and Colobus Trust, have given extensive onground support towards this initiative. KESCOM represents a national integrated approach to sea turtle conservation promoting community participation in various conservation activities that include research and monitoring, public awareness and advocacy. KESCOM has successfully campaigned for the mandatory use of Turtle Excluder Devices (TEDs) in all trawlers operating within Kenyan waters.

Olendo, M. I., Munga, C. N., Okemwa, G. M., Ong'anda, H. O., Mulupi, L. K., Mwasi, L. D., & Mohamed, H. B. (2016). Current Status of Sea Turtle Protection in Lamu Seascape, Kenya: Trends in Nesting, Nest Predation and Stranding Levels. *Western Indian Ocean Journal of Marine Science, 15*(1). Retrieved from https://www.ajol.info/index.php/wiojms/article/view/127832

Temporal and spatial trends in sea turtle nest protection, predation and mortalities in the Lamu archipelago, Kenya were investigated based on nesting beach monitoring efforts conducted among five locations comprising 34 beaches. The nesting data was collected for a period of 17 years from 1997 – 2013 through beach patrols using standardized protocols while mortality data spanned from 2001 – 2013. The causes of mortality were determined through general external examination. The green turtle, hawksbill, olive ridley and loggerhead turtle were recorded in the area. Out of a total of 2,017 nests recorded, 64.4% (n = 1299) were translocated while 10.2% were predated. Predation levels were not significantly affected by seasonality ($p > 0.05$); although the levels were lower during the wet Southeast Monsoon (SEM) season (9.2 ± 2.2 %) compared to the Northeast Monsoon (NEM) season (14.8 ± 3.0 %). A total 227 mortality cases were recorded between 2001 and 2013 of which fishery- related causes were the highest representing 53%. This was followed by unknown causes which constituted 20%, shark attacks (13%) and the tumor causing viral disease fibropapillomatosis (11%). Overall, the highest number of mortalities was recorded for Mkokoni (35%) while the lowest was recorded for Mvundeni (4%). Green turtles comprised 79% of the mortality cases recorded with a mean size range of 68.9 ± 1.9 cm CCL. The incidences of mortality occurred year-round; however, the incidence of strandings was higher during the dry NEM season in the months of January to March when fishing effort is also highest. The success of sea turtle conservation efforts in the Lamu seascape is clearly demonstrated by the increased nesting activity over time, as well as the reduced trend on sea turtle nest predation levels. To continue this

success, it is vital that sea turtle conservation efforts including a comprehensive monitoring programme are supported.

Olendo, M. I., Okemwa, G. M., Munga, C. N., Mulupi, L. K., Mwasi, L. D., Mohamed, H. B., . . . Ong'anda, H. O. (2019). The Value of Long-Term, Community-Based Monitoring of Marine Turtle Nesting: A Study in the Lamu Archipelago, Kenya. *Oryx, 53*(1), 71-80. https://doi.org/10.1017/s0030605317000771

Monitoring of nesting beaches is often the only feasible and low-cost approach for assessing sea turtle populations. We investigated spatio-temporal patterns of sea turtle nesting activity monitored over 17 successive years in the Lamu archipelago, Kenya. Community-based patrols were conducted on 26 stretches of beach clustered in five major locations. A total of 2,021 nests were recorded: 1,971 (97.5%) green turtle Chelonia mydas nests, 31 (1.5%) hawksbill Eretmochelys imbricata nests, 8 (0.4%) olive ridley Lepidochelys olivacea nests and 11 (0.5%) unidentified nests. Nesting occurred year-round, increasing during March-July, when 74% of nests were recorded. A stable trend in mean annual nesting densities was observed in all locations. Mean clutch sizes were 117.7 +/- SE 1 eggs (range 20-189) for green turtles, 103 +/- SE 6 eggs (range 37-150) for hawksbill turtles, and 103 +/- SE 6 eggs (range 80-133) for olive ridley turtles. Curved carapace length for green turtles was 65-125 cm, and mean annual incubation duration was 55.5 +/- SE 0.05 days. The mean incubation duration for green turtle nests differed significantly between months and seasons but not locations. The hatching success (pooled data) was 81.3% (n = 1,841) and was higher for in situ nests (81.0 +/- SE 1.5%) compared to relocated nests (77.8 +/- SE 1.4%). The results highlight the important contribution of community-based monitoring in Kenya to sustaining the sea turtle populations of the Western Indian Ocean region.

Thoya, P., Pérez-Jorge, S., Okemwa, G. M., Mwamlavya, H., Tuda, A., Wambiji, N., & Maina, J. M. (2020). Spatial Patterns and Environmental Risks of Ringnet Fishing Along the Kenyan Coast. *African Journal of Marine Science, 42*(1), 23-33. https://doi.org/10.2989/1814232X.2019.1705392

Ringnet fishing began in the early 20th century and is practised worldwide, mainly to target nearshore pelagic species. The method was introduced to Kenya's coastal waters by migrant fishers from Tanzania. However, the impacts of this fishing gear remain poorly assessed. We assessed the spatial distribution of ringnet fishing effort and its possible effects on ecosystem components, such as coral reefs, marine megafauna and marine protected areas, on the south coast of Kenya. We tracked 89 ringnet fishing trips made from December 2015 to January 2016 and used spatial multicriteria analysis to determine hotspots of possible environmental risks. The results showed that habitat type and bathymetric profile influenced the spatial distribution of ringnet fishing effort. Mixed seagrass and coral habitats had the highest concentration of the effort. Most of the habitats in the study area were moderately exposed to the impacts of the ringnet fishery. The study identifies high-risk areas that require spatial measures to minimise possible environmental risks of the gear both to habitats and to endangered sea turtles.

Wamukota, A. W., & Okemwa, G. M. (2009). Perceptions About Trends and Threats Regarding Sea Turtles in Kenya. In *Advances in Coastal Ecology: People, Processes and Ecosystems in Kenya.* (pp. 193-205). Leiden, Netherlands: African Studies Centre Retrieved from http://hdl.handle.net/1834/8305

Information on perception, trends, status and major conservation issues relating to sea turtles in Kenya was collected between November 2003 and December 2004 among 23 communities along the 600 km long Kenyan coast. The objective was to determine major conservation issues and identify solutions. The survey employed participatory rural appraisal (PRA) methods including transect walks, observation, resource mapping, problem visualizations, seasonal calendars, time lines, resource prevalence trend lines and structured interviews. Data was analysed through ranking and scoring. Respondents indicated a steady decline of 25-75% of the sea turtle populations in six sites since the early '80s. Overall, marine fisheries were identified as a leading cause of marine turtle strandings on Kenyan beaches accounting for over 50% of reported cases. Over 90% of the participants indicated willingness to conserve sea turtles by using appropriate fishing gear but cited lack of capital outlay to purchase the recommended gear. Recommendations included further research to better understand the socio-economic and socio-cultural dimensions underlying the conservation and management of marine resources as well as adopting a participatory and integrated development approach in the management of marine resources in Kenya.

Section IV: Marine Mammals

Barber, R., Sikora, I., & Nimak-Wood, M. (2016). Blue Whales *Balaenoptera musculus* in Offshore Waters of Kenya. *African Journal of Marine Science, 38*(2), 279-284. https://doi.org/10.2989/1814232X.2016.1182590

Observations of blue whales were made in Kenyan offshore waters during a seismic survey from September 2014 to January 2015. These represent the first live at-sea sightings of blue whales reported from Kenyan waters. All 30 sightings occurred between September and October in waters ranging from 2990 to 4705 m depth. It is unknown to which of the three possible subspecies the animals sighted belong. Based on timing and geographical location, they are likely to have been either Antarctic blue whales *Balaenoptera musculus intermedia*, Madagascar pygmy blue *whales B. m. brevicauda* or northern Indian Ocean blue whales *B. m. indica*.

Kiszka, J., Muir, C. E., Poonian, C. N. S., Cox, T. M., Amir, O. A., Bourjea, J., . . . Bristol, N. (2009). Marine Mammal Bycatch in the Southwest Indian Ocean: Review and Need for a Comprehensive Status Assessment. *Western Indian Ocean Journal of Marine Science, 7*(2), 119-136. Retrieved from https://www.bmis-bycatch.org/references/fj636x3s

Incidental catch in fishing gears is a serious, worldwide threat to marine megafauna (particularly sea turtles, sharks and marine mammals). In order to inform the implementations of effective bycatch management strategies, an important first step is to conduct an assessment of the extent of this threat. In the southwest Indian Ocean (SWIO) (from 0 to 25°S, from eastern Africa to 60°E), there is a paucity of published data describing marine mammal bycatch. This review collates available information from a range of sources relating to marine mammal bycatch for nine SWIO countries: Mozambique, Tanzania (including Zanzibar), Kenya, the Seychelles, the Comoros, Mayotte, Madagascar, Reunion Island and Mauritius. An overview of the bycatch issue within each country is provided by considering the following key points: status of marine mammals, fishing effort, bycatch information and mitigation measures. Quantitative information, especially with respect to number of bycaught animals and impact on local populations, was found to be limited (except for Zanzibar). However, it is clear that several fisheries do incidentally catch marine mammals in the region, those of greatest concern being gillnets catching dugong (*Dugong dugon*) and coastal dolphins (*Tursiops aduncus* and *Sousa chinensis*) in Zanzibar and southwest Madagascar. To date, mitigation measures, particularly efforts to reduce the use of these gears, have not been employed effectively. From the information provided in this review, it is evident that it is critical to initiate the collection of quantitative data for marine mammal bycatch (particularly in gillnets) and its impact on local marine mammal populations and to implement relevant and effective mitigation measures.

Kiszka, J. J., Muir, C. E., Amir, O. A., Drouot-Dulau, V., Razafindrakoto, Y., & Wambiji, N. (2008). *Incidental Catch of Marine Mammals in the Southwest Indian Ocean: A Preliminary Review.* IWC IWC SC/60/SM13 12. Retrieved from https://www.bmis-bycatch.org/references/4s8dtibe

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.

Section V: General

Julius, F., Agneta, N., & Dixon, W. (2002). Marine Protected Areas in the Eastern African Region: How Successful Are They? *Ambio, 31*(7/8), 503-511. Retrieved from https://pubmed.ncbi.nlm.nih.gov/12572815/

This article reviews the governance and management of Marine Protected Areas (MPAs), and the coral reefs they contain, in the eastern African Region. This includes the Comoros, Kenya, Madagascar, Mauritius, Mozambique, Tanzania, and the Seychelles. Three generations or categories of MPAs are distinguished: i) small areas for protection of a single species or unique marine habitat; ii) large multiple use MPAs designed for coastal development as well as biodiversity protection; and iii) MPAs managed by a nongovernmental organization (NGO) or the private sector. Each of these MPA types is examined according to the policies, legislation, and management systems they entail as well as the economic and community situation they operate within. The paper also provides a review of some eastern African MPAs in terms of their size and location, the type of MPA, zonation schemes, and financial status. The successes of the different types of MPAs are discussed based on specific indicators, such as changes in biodiversity, infrastructure, compliance to regulations and the level of involvement of primary stakeholders in the management. From the review it is clear that a fourth generation of MPAs may be forthcoming; community based MPAs. Although lack of data makes it difficult to assess the effectiveness of these different categories of MPAs, it is clear that no MPA can succeed without support of the local communities. Generally, the results of the analysis are promising for MPAs, however a lack of data is hampering a deeper analysis. The major issues facing MPAs in the region are highlighted, as well as some regional initiatives striving to address these issues. A number of recommendations are made, aiming to strengthen the establishment and management of MPAs in the eastern African region.

National Environment Management Authority. (2009). *State of the Coast Report: Towards Integrated Management of Coastal and Marine Resources in Kenya.* Government of Kenya Nairobi, Kenya. Retrieved from http://hdl.handle.net/1834/7215

This inaugural State of the Coast Report 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 resource overexploitation and environmental degradation. The document will serve as the foundation for the development of an Integrated Coastal Zone Management (ICZM) Plan for Kenya. Chapter 1 describes the biophysical settings of the Kenya coast, including coastal geomorphology, oceanography, hydrology and climatic influences on the various biophysical settings. The geology of the Kenya coast is mainly sedimentary, with a well developed fossil reef complex that is extensively exploited by the building industry. The coastal climate in Kenya is influenced by the monsoon winds and characterized by two distinct rainy seasons. The long rains occur between March and May, coinciding with South-East monsoons, and the short rains from October to December, corresponding with the North-East monsoons. Annual average rainfall along the coast varies from about 500–900 mm/year on the northern coast to 1000–1600 mm/year on the southern coast. Average temperatures range between 24 and 30 °C. The various marine and coastal ecosystems at the Kenyan coast, including coral reefs, seagrass beds, mangroves, sandy beaches, sand dunes and terrestrial forests, are discussed in Chapter 2. These ecosystems provide livelihoods to local communities as well as important goods and services, which include cultural services. Mangroves, for instance, provide spawning grounds to many commercially important groups of fish and yield an array of direct products such as timber, fuelwood and medicines. Kenya's coast is also home to numerous

Threatened species—38% of the 159 tree and shrub species; 27% of the 71 birds species, and 5 of 9 mammalian species classified as Threatened occur here. These species include marine mammals (e.g. whales, dolphins and dugongs), sea turtles, shoreline birds, fish, and terrestrial species such as Colobus monkeys and Tana mangabeys. Chapter 3 is devoted to these species of special concern, highlighting their composition, habitats and status. Chapter 4 gives a socio-economic assessment of coastal communities and how they interact with the environment and its associated ecological services. The coastal population is estimated to be 2.5 million, which is 9.0% of the total country's population. The largest indigenous ethnic group along the coast is Mijikenda, composed of nine sub-tribes. The Kenyan coast has over the centuries attracted diverse ethnic and racial groups, with the highest increase in population densities occurring in urban centres such as Mombasa and Malindi. Poverty is widespread in rural areas of the coastal region, ranging from 30% in Bura to 84% in Ganze. Land tenure has historically remained a contentious issue, with huge tracts of land being owned by absentee landlords and many households in rural constituencies living as squatters on the land. This issue hinders sustainable development, since the poor are more likely to engage in unsustainable resource-use practices in an effort to meet immediate survival needs. In Chapter 5 the various economic activities taking place at the Kenyan coast are discussed. Tourism and shipping are the highest contributors to the coastal economy, contributing 45% and 15% respectively. Artisanal fishery lands 95% of the total marine catch, contributes 6% to the coastal economy, and is the main source of livelihood for more than 60,000 households. However, there is growing concern about over-exploitation and the associated declining catch within inshore marine fisheries, while the offshore deep sea fisheries have remained largely unexploited by Kenya. The contribution of mining has remained low, but is likely to increase once a new titanium mining project in the South Coast starts active production for export. Most rural farmers at the coast still practice traditional farming methods, and rarely apply appropriate soil- and water-conservation measures. This has led to land degradation and perennially low crop yields. Consequently, the coastal population depends heavily on agricultural produce from outside the region. Due to unresolved land tenure issues, many of the local people do not have title deeds which they can use as collateral to secure credit for agricultural development. The challenges facing the sustainable utilization and management of coastal and marine resources are discussed in Chapter 6. Destructive practices (e.g. dynamite fishing, forest clearing, housing construction on the shoreline and land reclamation), pollution from industrial and domestic wastes, inappropriate land-use practices and unregulated development have individually and cumulatively led to resource overexploitation and environmental degradation. In addition, global climate change has led to altered rainfall patterns, droughts, floods and sea level changes. The impacts of these factors are manifested as significant physical alterations and degradation of habitats, leading to loss of livelihoods, changes in social structures, loss of cultural heritage and resource-use conflicts. The main drivers of these threats and impacts to coastal resources range from social (e.g. human population pressure), institutional and macro- and micro-economic issues; natural phenomena related to climate change; and institutional, e.g. limited knowledge, lack of technologies for cleaner production, and inadequate natural-resource-management capacity. A number of institutions are legally mandated to oversee the sustainable management of coastal resources. Section 55 of Environmental Management and Conservation Act (EMCA, 1999) specifically mandates NEMA to assess, plan and coordinate sustainable management of resources. The legal and institutional frameworks governing the management of Kenya's coastal and marine resources, as well as international instruments to which Kenya is signatory, are discussed in Chapter 7. This chapter also reviews the roles of the various institutions currently engaged in this work. Chapter 8 of the report provides recommendations for possible interventions that would promote a healthy environment and sustainable management of coastal and marine resources. Some of the interventions proposed include: greater community involvement in resource management; adherence to the physical planning regulations for shoreline development; adoption of appropriate land-use practices to ensure soil and water

conservation and improved crop yields; increased government support to coastal and marine conservation programmes; and application of an ecosystem approach in resource management. All these proposed interventions will be captured in the ICZM Plan currently under formulation.

Osuka, K., Samoilys, M., Mbugua, J., Leeuw, J., & Obura, D. (2016). *Marine Habitats of the Lamu-Kiunga Coast: An Assessment of Biodiversity Value, Threats and Opportunities*. Retrieved from https://cordioea.net/marine-habitats-of-the-lamu-kiunga-coast/

The oceanography, geology, connectivity with Gulf of Aden, diverse ecosystems and cultural world heritage are the Outstanding Universal Values of Lamu-Kiunga seascape. The oceanography supports a productive marine ecosystem that hosts a variety of marine species. The coral cover in 2015 averaged 16%, with a range of 35% inshore <5% on the deep offshore reefs. Globally, rare coral genera of Siderastrea, Horastrea, Caulastrea, Moseleya and endemic angelfish Apolemichthys xanthotis as well as six shark and nine ray species, Dugongs, turtles, whales and dolphin occur in the seascape. Mangrove cover and quality is good but has reduced over decades. The main threats to marine biodiversity include; increase in human population, high poverty levels, deforestation of mangroves, clay mining for pottery and land tenure. In response to these threats, public and civil institutions have engaged in providing solutions. Enactment of a wide range of national, coastal and environmental legislation is part of the policy response to the threats. The adoption of locally-managed marine areas has also improved management of marine biodiversity. It is envisioned that integrating local knowledge, government regulations and science through a marine spatial planning approach has the potential to benefit ecosystems and communities living around this unique part of Kenya's coast.

Samoilys, M., Osuka, K., & Maina, G. W. (2011). Review and Assessment of Biodiversity Values and Conservation Priorities Along the Tana Delta - Pate Island Coast of Northern Kenya. In *Cordio Status Report 2011.* (pp. 1-21). Mombasa, Kenya: Coastal Oceans Research and Development – Indian Ocean (CORDIO) East Africa Retrieved from http://hdl.handle.net/1834/7760

The purpose of this study was to review and assess the biodiversity values and identify priority areas for conservation intervention along the Tana-Pate coast of northern Kenya. The study was done through a review of literature and a 10 day field survey in January-February 2011 to qualitatively validate the literature review. We also consulted key informants from organisations with a history of working in the area and community members on their perceptions of biodiversity values and their socio-economic importance and what they felt were conservation priorities and concerns. This area of Kenya has a rich cultural history of the Swahili /Omani sultanates, as seen in the numerous ruins dating back to the 10th Century. Biodiversity values on this northern coastline of Kenya can be summarised into three unique areas of marine and coastal habitats: i) the vast Tana Delta with diverse and contiguous habitats from fresh to marine waters, including mangroves, beaches which extend for almost 100 km, and dunes supporting a wide range of fauna and flora and several endangered or threatened species including sharks. The Delta extends into the productive (nutrient rich) Ungwana Bay and the offshore North Kenya Bank which probably support the most valuable offshore fisheries in Kenya, though data are scant; ii) the Ziwaiyu-Pate- Kiunga coral reef system which occurs at the convergence of the East Africa Coastal Current (EACC) and the Somali current, which is a cold upwelling, bringing its own unique mix of coral and fish species which combine Arabian Gulf with East African species, including rare and endemic corals not seen elsewhere in East Africa; iii) one of the largest stands of mangrove forests in East Africa representing 60% of Kenya's mangroves and hosting Heriteria litoralis which is only found in the Tana

Delta and the Rufiji Delta in Tanzania. This region contains one of the last remaining populations of dugong (Dugong dugon) in East Africa; and extensive turtle nesting beaches for four endangered turtles: Hawksbill, Green, Loggerhead and Leatherback. The Tana Delta, the associated mangroves and the nutrient rich colder Somali current combine to create rich and productive waters supporting valuable fisheries in Ungwana Bay and the offshore North Kenya Banks. There are many threats to the conservation and management of the area which can be summed up as: poor governance, a sectoral approach to resource management, a lack of community access and participation in decision making, lack of access to environmental information for local communities, lack of legal remedy and land tenure insecurity. Consequently the management of the coastal and marine environment in this area is piecemeal and inadequate. The proposed Lamu Port in the channel between Manda and Pate islands will have severe environmental consequences.

Temple, A. J., Kiszka, J. J., Stead, S. M., Wambiji, N., Brito, A., Poonian, C. N. S., . . . Berggren, P. (2018). Marine Megafauna Interactions with Small-Scale Fisheries in the Southwestern Indian Ocean: A Review of Status and Challenges for Research and Management. *Reviews in Fish Biology and Fisheries, 28*(1), 89-115. https://doi.org/10.1007/s11160-017-9494-x

In developing regions, coastal communities are particularly dependent on small-scale fisheries for food security and income. However, information on the scale and impacts of small-scale fisheries on coastal marine ecosystems are frequently lacking. Large marine vertebrates (marine mammals, sea turtles and chondrichthyans) are often among the first species to experience declines due to fisheries. This paper reviews the interactions between small-scale fisheries and vulnerable marine megafauna in the southwestern Indian Ocean. We highlight an urgent need for proper documentation, monitoring and assessment at the regional level of small-scale fisheries and the megafauna affected by them to inform evidence-based fisheries management. Catch and landings data are generally of poor quality and resolution with compositional data, where available, mostly anecdotal or heavily biased towards easily identifiable species. There is also limited understanding of fisheries effort, most of which relies on metrics unsuitable for proper assessment. Management strategies (where they exist) are often created without strong evidence bases or understanding of the reliance of fishers on resources. Consequently, it is not possible to effectively assess the current status and ensure the sustainability of these species groups; with indications of overexploitation in several areas. To address these issues, a regionally collaborative approach between government and non-governmental organisations, independent researchers and institutions, and small-scale fisheries stakeholders is required. In combination with good governance practices, appropriate and effective, evidence-based management can be formulated to sustain these resources, the marine ecosystems they are intrinsically linked to and the livelihoods of coastal communities that are tied to them.

Temple, A. J., Wambiji, N., Poonian, C. N. S., Jiddawi, N., Stead, S. M., Kiszka, J. J., & Berggren, P. (2019). Marine Megafauna Catch in Southwestern Indian Ocean Small-Scale Fisheries from Landings Data. *Biological Conservation, 230*, 113-121. https://doi.org/10.1016/j.biocon.2018.12.024

The measurable impacts of small-scale fisheries on coastal marine ecosystems and vulnerable megafauna species (elasmobranchs, marine mammals and sea turtles) within them are largely unknown, particularly in developing countries. This study assesses megafauna catch and composition in handline, longline, bottom-set and drift gillnet fisheries of the southwestern Indian Ocean. Observers monitored 21 landing sites across Kenya, Zanzibar and northern Madagascar for 12 months in 2016–17. Landings

(n = 4666) identified 59 species, including three sea turtles, two small cetaceans and one sirenian (Dugong dugon). Primary gear threats to investigated taxa were identified as bottom-set gillnets (marine mammals, sea turtles and batoids), drift gillnets (marine mammals, batoids and sharks) and longlines (sharks). Overall, catch was dominated by small and moderately sized coastal requiem sharks (Carcharhiniformes) and whiprays (Dasyatidae). Larger coastal and oceanic elasmobranchs were also recorded in substantial numbers as were a number of deeper-water species. The diversity of catch demonstrates the potential for small-scale fisheries to have impacts across a number of ecosystems. From the observed catch rates we calculated annual regional elasmobranch landings to be 35,445 (95%CI 30,478–40,412) tonnes, 72.6% more than officially reported in 2016 and 129.2% more than the 10-year average (2006–16), constituting 2.48 (95%CI 2.20–2.66) million individuals. Productivity-Susceptibility Analyses indicate that small and moderately sized elasmobranchs are most vulnerable in the small-scale fisheries. The study demonstrates substantial underreporting of catches in small-scale fisheries and highlights the need to expand efforts globally to assess the extent and impact of small-scale fisheries on vulnerable marine species and their respective ecosystems.

Wamukoya, G. M., Mirangi, J. M., Ottichillo, W. K., Cockroft, V., & Salm, R. (1996). *Report on the Marine Aerial Survey Marine Mammals, Sea Turtles, Sharks and Rays.* Kenya Wildlife Service Mombasa, Kenya. Retrieved from http://hdl.handle.net/1834/7331

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 seaturtles 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.

Wronski, T. (2008). Observations on the Marine Malacofauna of the Lamu Archipelago, Kenya. *Journal of Conchology, 39*, 585-590. Retrieved from http://www.conchsoc.org/node/4806

The marine malacofauna of the Lamu Archipelago in Northern Kenya was studied in 2001. In this paper, known data from, Spry (1964, 1968), Sawyer (1999, 2000), Wronski (2007) and Rosenberg et al. (2004) are supplemented by the results of the author's fieldwork. A total of 55 gastropod and bivalve species was recorded; of which 23 are reported from Zanzibar but not listed in the East Africa section of the OBIS Indo-Pacific Molluscan Database. Five species *(Pseudominolia climacota* (Melvill, 1897); *Terebra nassoides Hinds*, 1844; *Pupa cf solidula* (Linne, 1758); *Ostrea (Nanostrea) deformis Lamarck*, 1819; *Divaricella irplex* (E.A. Smith, 1885)) were neither reported from Zanzibar nor listed by Rosenberg et al. (2004), and are therefore considered new for East Africa. The study represents the first comprehensive species list of marine gastropods and bivalves found in the tidal flats and beaches of the Lamu Archipelago.