

ORAL PRESENTATIONS

STABLE ISOTOPES COMPOSITIONS OF ORGANIC CARBON AND NITROGEN AS INDICATOR OF POLLUTION IN MANGROVE ECOSYSTEM

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ABSTRACT

The stable isotopes compositions of organic carbon and nitrogen as well as the contents of organic carbon and nitrogen for various mangrove plant species, animals and sediment from polluted (Msimbazi and Mtoni located within the city of Dar es Salaam, and Maruhubi located within the Zanzibar town) and unpolluted (Pete located about 40 km south east of Zanzibar town and Wami located about 200 km north of the city of Dar es Salaam) mangrove forests in Tanzania are used to assess impact of pollution on the mangrove ecosystem. Plant and animals collected from contaminated mangrove forests of Msimbazi, Mtoni and Maruhubi are enriched in ^{15}N relative to those from uncontaminated forests of Pete (Unguja Island, Zanzibar) and Wami (mainland Tanzania). Similarly, sediments from contaminated sites are enriched in ^{15}N relative to uncontaminated sediments with sediments from Msimbazi being the most enriched in ^{15}N (9.2‰). Animals collected from Msimbazi are most enriched in ^{15}N relative to other animals from other sites as well as mangrove plants. This results shows that nitrogen stable isotopes track pollution in the ecosystem. Enrichment in ^{15}N could be a result of utilization of residue nitrogen that is enriched in ^{15}N as a result of denitrification process. There are no differences in the stable isotopes of organic carbon between mangroves thriving in polluted and unpolluted environments. The stable isotopes compositions of organic carbon of sediments for all five mangrove stands are heavier relative to that of plant materials. The stable isotopes compositions for sediments averages -24.8‰ while that of mangroves averages -28.9‰. Generally, the stable isotope compositions of organic carbon for animals such as *Saccostrea cucullata*, *Isognomon ephippium*, *Scylla serrata*, *Uca annulipes* are enriched in ^{13}C relative to sediments and plant components. Most of the collected animals are filter feeder and detritus feeders, and this indicates that sediments mixed with algae are the major sources of these organisms. The *Avicennia marina* species in all forestes have the lowest C/N ratios relative to other mangrove tree species of *Rhizophora mucronata*, *Sonneratia alba*, *Bruguiera gymnorhiza*, and *Ceriops tagal*. Sediments have the lowest contents of organic carbon and nitrogen while animals have lowest C/N ratios showing richness in nitrogen.

**TANZANIA REEF CORALS DEVASTATION BY
CROWN OF THORNS STARFISH (*Acanthaster planci*)**

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ABSTRACT

Crown-of-thorns starfish (*Acanthaster planci*), the coral eating asteroid, is one amongst the serious natural coral reef stressors when emerge in outbreak condition. Incidences of outbreak populations of crown-of-thorns starfish (COTS) in Tanzania was first reported in 1988 on Pange reefs, Zanzibar. The next outbreak incidences were reported in 1995-1997 in Mnazi Bay, Mtwara and on Changuu (Prison) Island reefs. Inundated COTS plague emerged from year 2000 and has persisted until now. The recent outbreak was more intensive and extensive than previous ones. Outbreaks of up to 0.313 individual per square meter were recorded on reefs of Zanzibar town. Crown-of-thorns starfish outbreaks caused rapid loss of coral health, adding on to the coral bleaching devastation of 1998. Many of the affected reefs are in their worst healthy condition now. Vulnerable corals such as Acroporids were hit hard. *Acropora* contribution to benthic cover was reduced from about 25% in 2001 to 1-5 % in 2006 on reefs off Zanzibar town (Changuu and Bawe). On short term basis, no serious impact could be associated with fish catches and tourism. Higher algal abundance on reef favoured herbivores over corallivore fish. On the long-term basis, loss of coral reef biodiversity and reef authenticity as a result of deteriorated coral health is anticipated. This might lead to suffering of coastal economies based on healthy reefs such as fisheries and tourism. Unless, controlled human activities on reefs may aggravate the situation. Removal attempts have been undertaken at different sites. However, successful removal program was reported only from Chumbe Island Coral Sanctuary where removal was done by employed Rangers consistently. Efforts to reduce COTS density in other areas, e.g. Off Zanzibar town, Dar es Salaam Marine Reserves and Tanga was too little, mainly due to merger funds. Unfortunately, one of COTS natural predators, *Charonia tritonis*, the giant triton shelled mollusk, are rare (probably threatened). COTS population outbreaks remain one of the most difficult management problem-facing coral reefs today. This paper describes the COTS problem in Tanzania and provides some of the required actions to minimize the impacts

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INTERGRATING SEAWEED AND SHELLFISH CULTURE TO IMPROVE THE WOMEN'S ECONOMIC STATUS

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ABSTRACT

Women are the dominant actors in the intertidal activities which includes seaweed farming, gleaning and shellfish farming of which are among their major income earning activities. Several problems currently face seaweed farming activities which among others includes lack of farming implements and low price. Problems facing mollusk collection includes lack of proper and reliable markets as well absence of control in the collection areas. This survey was conducted in three villages in Zanzibar; Nyamanzi, Fumba and Unguja ukuu to determine the extent of these problems and how to find solutions to reduce the problems. The results indicate that while men participate in artisanal fishery sector, women participate more in the intertidal activities. They collect a range of bivalves and gastropods of which the most valuable species collected in large quantities are (*Anadara Antiquata*, *Pinctada Magratifera*, *Atrina vexillum*, *Chicoreus ramous*, *Cypraea tigrus*, *Pinna murcata*, *Pleoroploca trapezium* and some species of sea cucumbers. Due to a reduction in price of seaweed and overexploitation of the bivalves many quit the job whilst others decided to culture the mollusks in the intertidal zones. This special study examines how integrating seaweed farming with bivalve farming could increase the economic welfare of the women of which the problem has increased especially in areas where communication is poor. The study recommends the ongoing alternative new culture technique so as to be able to do both seaweed and bivalve culture. Improving market techniques by proper processing of the bivalves. Advertising and encouraging alternative income activities such as jewellery making using shells and improving control and influence of beneficiaries in the project decision making, as well as strengthening supportive methods to encourage farmers.

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RECENT ADVANCES IN MARICULTURE DEVELOPMENT IN TANZANIA

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ABSTRACT

This paper elaborates on the success of mariculture activities that have been conducted by the Institute of Marine Sciences (IMS) since its inception in 1979. In the early 80s to early 90 IMS participated in seaweed research and development until commercial activities of the seaweed *Eucheum Spinosum* started in 1989.. The first environmental and social economic impacts assessment of seaweed farming was also conducted by IMS. Recently after noting the seaweed die-offs caused by the dynamism of the inter-tidal in many parts of Tanzania, the Institute started to work on an off shore floating method of seaweed farming and also seed preservation during bad weather. The first experiments on cage culture of finfish were done successfully by IMS in mid 1980's. IMS is currently planning further development on cage culture methodology. However, the first pond mariculture of finfish were initiated in the 1995 by a feasibility study on possibilities of finfish farming in Pete and Makoba followed by actual development of ponds and culture of rabbit fish in 1998, milkfish in the 2000 and mullets in the 2001. From 2001 a farmer at Muungoni on Zanzibar has annually been harvesting 50 kg in a backyard kind of aquaculture pond of 1000 m². Similar but larger ponds in Changwahela and Mkuranga and Mbuo in mainland Tanzania are being harvested an average of 0.3-0.5 tons per year from 2002. Currently the Institute is developing three 1 ha commercial ponds for milkfish culture estimated to produce 2 tons per year in Mkuranga and Bagamoyo... Some of the ponds are fertilized to produce lab lab while in the others a special cheap feed developed and tested by IMS is used. The first experiments on shellfish spat collection were done by the Institute in 1995. In 2000 species of *Pinctada*, *Isognomon* and *Anadara* were grown in ponds at Makoba. In 2004 the first field cultured shellfish were harvested in Fumba and Bweleo. More recently, *Pinctada* species have been seeded with plastic beads to produce half pearls. Currently the farmers are being trained on proper management of shellfish and making ornaments from shells. IMS working with Western Indian Ocean Marine Science Association (WIOMSA) and Coastal Resources Center (CRC) of the University of Rhode Island in a project Sustainable Coastal Communities and Ecosystems (SUCCESS) Global has already produced a half pearl farming manual and is expected to produce milkfish farming and economic analysis manuals for oysters and pearl production. In addition IMS and its partners have produced 3 baseline documents one each for Menai Bay, Bagamoyo and Mkuranga.. Further development in all these mariculture activities demand some studies aimed at protecting biodiversity, ensuring sustainability, and controlling developments to avoid adverse conditions related to pollution, environmental degradation user conflicts. For this reason,, before and during the developments, environmental quality samples are collected and analyzed to evaluate changes. In Zanzibar at Fumba Penisular participatory zoning plans and policies are being developed to ensure smooth developments in integrated management, poverty alleviation and protection of the biodiversity. The presentation elaborates on these developments and highlight future expectations.

**IMPLEMENTING CONSERVATION STRATEGY TO ELIMINATE
DESTRUCTIVE FISHING PRACTICE**

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ABSTRACT

Mnazi Bay - Ruvuma Estuary Marine Park (MBREMP) was gazetted as the second Marine Park in Tanzania under the Marine Parks and Reserves Act number 29 of 1994 in July 2000. It comprises 11 villages with a population of 30,000 people based on 2000 Census. The development of Mnazi Bay Ruvuma Estuary Marine Park project incorporated in the work plan an activity of implementing conservation strategy to eliminate destructive fishing practices. The expected output for this activity was to implement the conservation strategy to eliminate illegal fishing through exchange of fishing gears. The preliminary assessments conducted in the park showed that the communities living in the area are economically poor and fishing is the mainstay of livelihood source and economy of the majority of Park residents. However, it is small scale and majority of fishers about 70% of fishermen are using traditional dug out canoes particularly, those operating in the estuary and mangroves (Litembe, Tangazo and Kilambo villages). The analysis of the common fishing gear employed in the Park area show a high dependence on destructive and illegal fine meshed nets & beach seines. The status of preliminary survey of the fishers in the park revealed that there are approximately 1500 fishers based in the Park area. Most of the fishermen are using dug out canoes which are not accessible to open sea water. Men dominate fishing while women and children do collect live seashells, octopus and sea cucumbers and few women involve in dagaa fishing using mosquito net “tandilo”. The fish surveys in the park showed that many species of commercially important were found only in small sizes, indicating that these species are being very heavily fished. In the Park, numerous fishing gear types are used, including destructive gears, from tiny mesh sizes of a few millimeters (such as mosquito nets) to monofilament gill nets and massive fish fence traps. The methodology used in this programme included registration of fishers and workshops that explain the process used to register all fishers with their number of destructive fishing gears. Since the Park Management realized that communities within park areas are very poor economically hence they can not afford to buy new and recommended nets, the process was in a form of “give net, get net” without considering actual cost. This programme has been implemented as pilot areas to start with in three villages of Litembe, Tangazo, Kilambo where the fishers are using the Ruvuma estuary.

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CERTIFICATION AS A WAY TO PROPAGATE MORE SUSTAINABLE FISHERY PRACTICES: FIRST PROJECT OF ITS KIND STARTED IN TANGA

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ABSTRACT

According to FAO 70% of the global fish stocks are either fully exploited or over-fished. If present global fisheries trends continue, the oceans will be “empty” 48 years from now. Generally, governments interference is limited to follow the changes. Nevertheless, a more pro-active attitude seems the only way to stop deterioration of the global fish stock. Hence fisheries stakeholders themselves are increasingly developing standards for sustainable fisheries. Certification systems available for sustainable fisheries are the MSC (Marine Stewardship Council), KRAV (a Swedish certifier mainly engaged in organic agriculture) and private labelling (like the Kyoga Wild label in Uganda). Certification encourages the private sector and fishermen to work together towards more sustainable practices, access niche markets and obtain premium prices. A first Tanzanian project working towards the export of certified sustainable fisheries products started late 2006. Artisanal fishermen from Tanga and Pemba work together with fish processor and exporter Sea Products Ltd (SPL) EPOPA (Export Promotion of Organic Products from Africa) leads this initiative and provides technical advice and training to all actors in the supply chain. The project commenced with registration of interested fishermen and identification of stakeholders. Early 2007 a first stakeholder meeting was organised to explain purpose and approach of the project. Subsequently fishermen, SPL, Tancert (Tanzanian certifier), government and NGO’s drafted standards for sustainable fisheries. It is expected that the first Tanzanian standards for sustainable fisheries will be ready by May 2007. Certification of fishermen may follow within months. The main objective of this project is to move the fisheries to a more sustainable method of operation. This objective will only be reached when the sustainable product gets a premium price. This premium price is expected to be obtained from both labelling the product as “certified sustainable” and by developing within the project a superior quality product. Prime quality produce from the project fishermen is expected to be obtained already during the training given by Sri Lanka experts. First export of certified sustainable fisheries product is expected to take place before the end of the year. In 2008 the project is expected to reach its full scale. Once export reaches the expected volumes there will be plenty of economic benefit for both exporter and fishermen to keep the project growing.

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ESTABLISHMENT AND INVOLVEMENT OF VILLAGE FISHERMEN COMMITTEES IN THE MANAGEMENT OF FISHERIES IN ZANZIBAR.

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ABSTRACT

Zanzibar is a country of islands composed of, and surrounded by coral reefs, estuaries, tidal flats, sea grasses and mangroves. The main exploiters of its marine resources are the local fishers. Zanzibar fisheries play an important role in providing income (both local and foreign) and providing employment to a number of fishers. The importance of Fisheries of Zanzibar is obvious even to the newly arrived tourist, yet while critical to the prosperity of the Tanzania, management of these resources is hampered (for many reasons, among these) by fishing communities. Almost all the Zanzibar communities have reported the decline of fishery resources and the disappearance of some fish species (eg milk fish). The decline of landings may be the result of overfishing and habitat destruction owing to high fishing effort and destructive fishing techniques particularly in the coastal shallow water areas. It can therefore be anticipated that more stock depletion will occur in the future unless effective management and enforcement measures are implemented. Towards the management process, the Department of Fisheries and Marine Resources, DFMR, facilitated the coastal communities to unite together and establish Village Fishermen Committees. The DFMR provides the resource users with a sense of ownership through full participation, cooperation and empowerment. Now there are 91 established village fishermen committees and about 92 seaweed farmers committees in Zanzibar. Because the leadership of these committees have been selected by the fishermen themselves, now there is a good cooperation between themselves in different villages, sit together and decide to use their marine resources in a sustainable manner. This paper will presents: The Fisheries Policy of Zanzibar, Responsibilities of Fishermen Village Committees, Support from the Government, Challenges, Government (Department of Fisheries) expectations from the Fishermen Village Committees

THE EFFECT OF RAINFALL ON PRAWN ABUNDANCE IN TANZANIA

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ABSTRACT

An investigation of the effect of rainfall on prawn abundance in Tanzania was undertaken using data collected over a six-year period between 1998 and 2003. The study was carried out off Bagamoyo (050 30' to 060 30'S) and Kisiju (070 05' to 070 45'S) in Coast region. Whereas data on prawn production was collected from commercial trawlers, data on rainfall was obtained from Tanzania Meteorology Agency (TMA). Results indicate the existence of a relationship between rainfall and prawn catches, reflected by a positive correlation between the two variables. This relationship can be explained in the context of rainfall influence on changes in salinity, a reflection of the preference of prawns to less saline (brackish) waters. The life cycle of prawn in Tanzania starts in October with the spawners migrating offshore. This migration is associated with the short rainfall season (October to December). This stage is followed by post-larvae migration to lagoons and estuaries where they grow to juvenile stage before migrating to shallow waters. During long rains (March to May), the pre-adult and adult prawns are found in the shallow coastal waters where most of the fishing takes place, and they remain here until they become mature for the new spawning season. Results from this study concur well with investigations done elsewhere.

CORAL REEF MONITORING IN TANZANIA: HAS IT BEEN USEFUL?

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ABSTRACT

Coral reef monitoring in Tanzania started in late 1980s. The main objective was to assess the extent of damage caused by the use of destructive resource harvesting practices, mainly dynamite and drug-nets. The derived information was intended to form the basis for setting up of legislation (control) measures and monitoring of further changed on reef healthy. Two systems evolved: community based coral reef monitoring and high tech monitoring using advanced tools (SCUBA, video and photography). Coral reef monitoring has contributed substantial descriptive information and has raised awareness to coastal communities and managers. Analysis of CRM data over the years has provided information on the dynamics of reef health conditions, e.g. cover and composition of reef corals, fish and macro-invertebrates. Power analysis both at spatial and temporal scale showed inadequate sampling effort at the moment, mainly due to high variance of parameters being measured. Furthermore, the ongoing monitoring programs did not include observation of environmental factors, hence, monitoring results were not linked or scientifically (statistically) analysed against possible causative factors (e.g. hydrographic conditions including seawater, benthic characteristics, availability of larval, and quantity). Lack of information on biological connectivity, e.g., larval source and dispersal mechanisms have diluted the interpretation of reef community dynamics, directly impacting on strategic management of reef invertebrates. Because of lack of analytical tools the link between socio-economic attributes and coral monitoring results has remained weak. This paper discusses critical issues in the past coral reef monitoring programs and provides recommendations for the next phase of coral reef monitoring strategies.

**THE ROLE OF MARINE RESOURCES IN POVERTY ALLEVIATION: A
CHALLENGE FOR TANZANIAN AND KENYAN GOVERNMENTS**

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ABSTRACT

The Tanzanian and Kenyan seas support diverse species (Buluku and Mburu: 2006) thus attracting tourists. A survey conducted by Africa Point, an online travel agency revealed that East Africa is the leading tourist destination on the continent with marine and coastal resources being one of the tourist attractions (The East African: 2006). However, in spite of the WWF (Worldwide Fund for Nature) and other agencies efforts along the Mafia Island near the Tanzanian coast and Kenyan coast (www.assets.panda.org), marine resources in these countries are threatened by various aspects (Kubegeya: 2006). This denies them from effectively reaping economic benefits. This paper discusses marine resource utilization with a view to determine appropriate strategies for sustainable use to alleviate poverty. Human activities are detrimental to marine resources (www.worldwildlife.org) either due to inadequate awareness and knowledge of the repercussions or a lack of commitment on such issues (Kariuki: 2006). The over-emphasis on preservation of inland tourism resources (Mbaria: 2006) is another part of the problem. The cost of appropriate equipments is beyond the reach of many. As a result, poor facilities are used which affects marine resources (Mande: 2006). These and other associated challenges make poverty alleviation a daunting task. If this situation persists, poverty will remain a long- term issue on the coastal communities and their respective countries regardless of immediate gains enjoyed. Coastal communities must effectively participate in marine conservation, management and utilization (Maro: 2006) through local leaders. Effective application of research findings could assist in conservation of marine resources (www.iucn.org). In conclusion, concerted efforts should be enhanced on sustainable use of marine resources in fighting poverty.

THE EFFECT OF ENVIRONMENTAL FACTORS ON ZOOPLANKTON ABUNDANCE AND SPECIES COMPOSITION IN PANGANI ESTUARY

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ABSTRACT

Zooplankton abundance, species composition and environmental parameters in Pangani Estuary were conducted during the wet season and dry season, to determine whether the environmental factor was able to affect zooplankton abundance and species composition. 10 sampling sites were surveyed over spring high tide at night using a 300 µm plankton net. The net sampled between 6 and 14 m³ of water at each site. Zooplanktons collected in these samples were identified to the level of major taxon only. Average density of zooplankton in the system was estimated to be 337 individuals m⁻³, but ranged from 80-900 individuals m⁻³. Zooplankton abundance peaked at stations in the middle of the estuary (250-900 ind.m⁻³) but was much lower in the upper reaches and near the mouth (mostly <150 ind. m⁻³). Zooplankton communities at most sites were dominated by Copepoda, but the Macrura (shrimps and prawns) and Brachyura (crabs) made important contributions at some sites. Zooplankton abundance was weakly correlated with chlorophyll a concentration which suggests that food supply does have some influence on abundance. Other factors considered important in controlling composition and abundance of zooplankton in the Pangani estuary include oxygen, salinity, turbidity and Temperature. Commonly occurring species group exhibiting strong homogenous correlation with environmental factors and predominant group exhibiting weak correlation with environmental factors and whose abundance / composition may be defined by biotic factors.

Key words: Zooplankton, environmental parameters, abundance and species

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FARMING INDUSTRY: VALUE ADDITION ON THE SEAWEEDS

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ABSTRACT

Seaweed farmers in Tanzania have been producing the seaweeds and selling as cash crop to buyers who export to countries such as France, USA, Denmark, and Spain, since the start of seaweed farming in 1989. The produced seaweeds are exported in bulk. Exporting in bulk leads to low prices paid to the producers (farmers). The farmers have no way of using the seaweeds within the country. The Seaweed Cluster Initiative (Seaweed CI), under the Innovation Systems and Innovative Clusters Programme is looking for ways of using the produced seaweed in the country through value addition. The main products that are being tried are seaweed soap, seaweed snacks/desserts and seaweed soft drinks. Trial making of seaweed soap was done during a workshop by mixing caustic soda, water, coconut oil, and seaweed powder. Seaweed desserts, originally from the Philippines, known as Maha blanca, Gulaman, and a third one that was named “Halua ya mwani” in Kiswahili were made during another workshop. The main ingredients for the desserts were corn flour, fresh milk, coconut milk, and sugar with bleached seaweed. The seaweed drink is made by mixing a variety of ingredients including fresh milk, cocoa, fruit syrup, raisins, and water melon. The CI is actively working on perfecting these uses of seaweeds so as to be able to produce at commercial scales. While working on these products, the CI’s other aim is to extract the gel *carrageenan* from the seaweeds and selling it instead of the bulk seaweeds. This, however, needs careful environmental consideration especially when making large processing plants. Thus, the CI is planning to start with small scale processing plants before indulging into large scale processing plants.

THE CULTURE BLACK- LIP OF THE PEARL OYSTER *PINCTADA MARGARITIFERA* AT BWELEO ZANZIBAR

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ABSTRACT

Pearl oysters are found throughout the tropical and subtropics and are commonly harvested from wild populations, however, due to increasing demand and attempting to reduce overexploitation from the wild population the culture of pearl oysters is rapidly increasing worldwide, including the western Indian Ocean. The oyster *Pinctada margaritifera*, which produces the most highly valued black pearls, occurs in East Africa. Growth of the black-lip pearl oyster, *Pinctada margaritifera* was studied from April 2006 to April 2007, in floating lines at Bweleo village Zanzibar. Growth in shell hinge length was measured once every month. At the same time, hydro biological parameters (temperature, salinity, oxygen concentration and turbidity) were measured. These did not show significant seasonal change, except for oxygen concentration, which increased due to the presence of large amount of seaweed during the hot season which increased oxygen concentration in the water. Turbidity was greater during the rainy season where visibility was reduced due to sedimentation. The whole period was favorable for oyster growth, hence shell growth was regular and did not exhibit any annual rings. as is often the case for bivalves. The average growth rate measured per month was around 4mm, which indicates that the site is favorable for pearl oyster growth. The results of the study are relevant to the understanding of the influence of the environment on growth rate of pearl oysters where the cultivation of bivalves is important for reducing pressure in wild stock harvesting and understanding the time for pearl oysters to reach a size of about 100 mm, the size at which they are suitable for nucleus implantation for pearl production, and the annual shell growth increment which correlated with the rate of nacreous deposition on the pearl. Although this study demonstrated significant variability in growth performance further studies are needed, especially concerning the hinge length of the oyster in relation to flesh growth as the important parameter that reflects both oyster health conditions together with the suitability of farming sites.

**OPPORTUNITIES AND CHALLENGES OF TURTLE CONSERVATION IN
SOUTHERN OF COAST TANZANIA**

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ABSTRACT

Tanzania has a coastline of about 800 km of which the last 45 km fall in Mnazi Bay - Ruvuma Estuary Marine Park (MBREMP). The park was gazetted sine July 2000 as the second Marine Park in Tanzania formed under the Marine Parks and Reserves Act number 29 of 1994. It is in the transboundary between two sister countries Tanzania and Mozambique where Ruvuma river forms a boundary. The Park developed a long term turtle conservation programme in October 2003 and its implementation started at the beginning of 2004. There are four main turtle nesting beaches within its coastline. The assessment revealed that turtles in this area are being threatened by deliberate fishing, slaughtering nesting females and pouching eggs from nests. As a strategy to safeguard this endangered species four Community Turtle Officers (CTOs) were selected to work together with MBREMP staff. Both groups received theoretical and practical training on turtle conservation. Since then, there has been a progress in turtle conservation activities that included beach patrols, protection of nests, tagging nesting female turtle, recording number of dead turtles and collecting skin samples for DNA analysis. Awareness raising and transfer of knowledge on turtle conservation was encouraged to allow a large number of park community to be aware. The first two years 2004 and 2005 nests recorded were 34 and 19 respectively. The former successfully produced 2,122 hatchlings which were all green turtles while the later that had 18 nests of green turtle 1 nest of hawksbill turtle produced 1302 and 65 hatchlings respectively. The year 2006 shows a substantial reduction especially when compared with the first two years. Until mid December, 12green turtle nests with 412 hatchlings from nests which hatched by then were recorded. The possible causes of the reduction in nesting are more than likely multiple, including higher mortality caused by pollution or capture by fishers (either deliberate or accidental by-catch). It is also possible that there is a naturally lower nesting intensity which is part of the natural cycle with relatively higher numbers every 2-3 years. The challenges in implementation lie on absence of trans-boundary conservation and management efforts and violation of regulations by local communities outside the park area. The next side of Mozambique has not been declared as protected area hence provide a loop hole to illegal fishermen even from the Tanzanian side deliberately engage in fishing turtles. It is recommend that the two sister countries should initiate trans-boundary conservation and management efforts that will promote eco-tourism and other economic opportunities leading it poverty alleviation

ECONOMICS OF BEE KEEPING FOR LIVELIHOOD IMPROVEMENT AND COASTAL FOREST CONSERVATION IN LINDI REGION, TANZANIA.

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ABSTRACT

Coastal Forests in Tanzania are typically tiny and fragmented due to by human disturbances. But these forests are among the most important forested blocks for conservation of endemic biodiversity species in tropical Africa. Many considerations and efforts on the urgency and possible conservation measures needed to limit or curb the rate of degradation have not yielded the desired results. As a traditional activity of smallholder beekeepers, beekeeping plays an important role in the conservation of forest resources. Nevertheless, very little has been documented on its potential contribution on livelihood improvement and coastal forest conservation in Tanzania. The study was conducted with the overall objective of assessing the potential of bee keeping on livelihood improvement and coastal forest conservation. Participatory Rural Appraisal (PRA), households questionnaire survey and interviews with key informants were used in data collection. Quantitative and qualitative methods were used for analyzing data. Data collected through PRA was analyzed with the help of the local community. Data collected through questionnaire surveys were coded and fed into Statistical Package for Social Science (SPSS) software. Parameters such as frequencies, percentages, mean and cross tabulation were computed. It was found that indigenous knowledge on beekeeping includes the use of bark, log, and gourd hives. The study identified that 51% and 43% of respondents mentioned poor marketing and lack of appropriate equipment as their pressing constraints respectively. Presence of natural forest (43%) and abundance availability of general land (30%) were the major opportunities. It was revealed that, bee products were packed into 0.5, 1, and 5 liters for marketing. The money gained was used to purchase basic needs and surplus was reinvested into other economic ventures thereby doing away with exploitation of coastal forests. The study concluded that if properly promoted, beekeeping activities have potential contribution on livelihood improvement and coastal forests conservation.

Key words: *Beekeeping, Coastal Forest Conservation, Livelihood Improvement, Lindi Region*

**IMPACT OF MANGROVE DEFORESTATION ON NUTRIENTS,
PHYTOPLANKTON COMMUNITY STRUCTURE AND BIOMASS**

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ABSTRACT

A one-year study was conducted in Kisakasaka, Zanzibar; to investigate the effect or changes caused by deforestation of mangroves on phytoplankton biomass and community structure in both water-column and benthic substrate. Two sites were selected: one deforested and another one that was relatively undisturbed. Most of the physico-chemical parameters measured: salinity, oxygen levels, temperature, pH and nutrients did not show significant differences between the two sites. However, results on phytoplankton biomass both in sediments and in the water-column, as well as organic matter content showed significant differences between the two sites ($p < 0.05$). Sediment chlorophyll-*a* was found to be significantly higher at the conserved site (average of $2.38 \pm 1.36 \text{ mg m}^{-3}$) than at the deforested one ($1.28 \pm 0.91 \text{ mg m}^{-3}$), while water-column chlorophyll-*a* was higher at the deforested than at the conserved site, with averages of 1.52 ± 1.26 and $0.71 \pm 0.62 \text{ mg m}^{-3}$, respectively. Organic matter content was higher at the deforested site ($25.98 \pm 1.51\%$) compared to the conserved mangrove site ($19.52 \pm 0.99\%$). Moreover, some types of phytoplankton were found to be site-specific. Here, water-column genera such as *Synedra*, *Bacteriastrium*, *Prorocentrum*, *Licmophora* and *Spirulina* were only observed at the deforested site, whereas *Isthmia*, *Gonyaulax*, *Surirella*, *Leptocylindrus* and *Guinardia* were only present at the undisturbed site. For benthic micro-algae, *Beggatoa* was abundantly observed at the deforested site only, while *Synechococcus* and *Nodularia* occurred only at the conserved mangrove site. Owing to its frequency of occurrence (45%), *Beggatoa spp.* is hereby suggested to be an “indicator” benthic microalga for mangrove deforestation.

**ASSESSMENT AND MITIGATION OF CETACEAN BYCATCH IN ZANZIBAR
GILLNET FISHERIES**

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ABSTRACT

We collected data on population size, distribution, genetic structure, mortality and potential population growth to allow assessment of fisheries bycatch of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) and humpback dolphins (*Sousa chinensis*) off the South coast of Zanzibar. Surveys were conducted between January and March 1999-2005 and in September 2002, to collect data on distribution and to identify individual dolphins. Mark-recapture analyses of the photographic data indicated small and resident populations of both species. The latest population size estimates were 136 (95% CI 124-172) bottlenose and 63 (95% CI 57-95) humpback dolphins. Genetic analyses of mtDNA and microsatellite data indicate that the bottlenose dolphins off the South coast of Zanzibar have limited exchange with animals in other areas. No genetic data were available for humpback dolphins. Observer programmes conducted onboard fishing boats were used to estimate the bycatch of dolphins in the drift- and bottom set gill net fisheries operating off the south coast of Zanzibar. Six observers were randomly placed on 14 fishing vessels. The observed effort represented 24% and 25% of the total annual effort in the driftnet and bottom set gillnet fisheries in the area, respectively. The total annual bycatch was estimated to 13 bottlenose dolphins in the driftnet fishery and 4 humpback dolphins in the bottom set gillnet fishery. These estimates represent annual mortalities of 9.6% for the bottlenose dolphins and 6.3% of humpback dolphins in the area. The determined levels of mortalities are unsustainable. As short-term mitigation measure to prevent bycatch acoustic devices (pingers) will be trialled in the fisheries in early 2007. As long-term solution alternative fishing methods will be investigated.

THE DYNAMIC NATURE OF THE PATTERNS OF UTILIZATION OF COASTAL RESOURCES: POVERTY ALLEVIATION STRATEGIES IN A QUAGMIRE

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ABSTRACT

The importance of sustainable utilization of natural resources, in terms of sustaining coastal people's livelihood is highly appreciated both nationally and internationally. This paper explores the ways in which social differentiation of coastal people in terms of class and gender as a result of both micro and macro forms of social organization, negotiate rights of access, control, and use of coastal resources. The mentioned differences have led to the current situation where some people have opportunities to benefit from the resources while others are constrained. This has been challenging efforts to alleviate poverty in coastal communities despite availability of abundant natural resources. The paper is a result of a qualitative study which was conducted in two Coastal communities namely Somanga Village and Songosongo Island found in Kilwa District, Tanzania. Data were generated using in-depth interviews, narratives and documentary review. The study found that the process of utilizing coastal resources does not take place in a vacuum, rather it takes place within a social, political, legal, economic and cultural context. It was also noted that , dynamism in the use of coastal resources that are patterned across gender and class, is mainly influenced by the interplay between forms of social organization. The utilization of coastal resources both at Somanga village and Songosongo Island was found to be patterned across class and gender lines. The nature of productive forces employed and the position one has in the relations of production define the extent to which an individual benefit from coastal resources. It was also clear that class and gender relations negotiate the possibilities for an individual to acquire the required tools and benefits from coastal resources. Changes in certain aspects of life either at the local or macro levels have been impacting on the way in which individuals access, control and utilize coastal resources. With liberalization coastal resource like fisheries and seaweed have been commodified for local and external markets, which have consequently intensified the exploitative relations of production. Competing goals between coastal resource users and managers at different levels result into conflicts between the resource user and managers. In the two communities the conflicts noted included those between fishers versus traders; Fishers versus owners of fishing vessels/gears or both commonly known as *tajiri*; fishers versus fishers especially on the lucrative fishing grounds; Seaweed Company against another seaweed company and institutional conflicts among others. The paper concludes that the economy of the rural coastal communities constitutes a set of interrelated activities. Social organization sets the context in which natural resources are utilized in a particular community. Users and managers of coastal resources have different abilities and powers hence power relations are part and parcel of the whole process of use and management of coastal resources. It is also a truism that power in the use and management of coastal resources is not without dynamism, it operates at the lowest extremities of the social positions of the user and managers of coastal resources i.e. even the less powerful users and institutions do exercise their own power against those who are powerful. Appreciation of social differentiation both when conceptualizing and addressing issues pertaining to coastal resource management and utilization, in a way that enables realization of people's welfare regardless of their difference in powers is vital.

IMPACTS OF COMMUNITY INVOLVEMENT IN MANAGEMENT AND MONITORING OF FISHERIES IN MPAS: A CASE STUDY OF FISH CATCH AND FISHING EFFORT DATA COLLECTION BY LOCAL COMMUNITIES IN MNAZI BAY-RUVUMA ESTUARY MARINE PARK (MBREMP)-MTWARA

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ABSTRACT

The paper attempts to examine the first quantitative fish catch and fishing efforts data collected in MBREMP for a period of January to September 2006. MBREMP with a seaboard of 62 km extending to the Ruvuma River has a total marine area of 430 km² with 11 villages, out of which 4 are seafront. Fishery in the Park is artisanal and mostly fishers do land at 13 identified sites. A study was conducted to establish baseline information on important fish species caught in the Park by various fishing gears at different sites/ areas; and length and weight of individual commercial fish species and to initiate a fisheries monitoring system in which trends in catches/ abundance of various fish species and length/ weight of commercially species in the Park will be monitored. Twelve members of the community were trained on how to collect catch and effort data for commercial species in the Park area, the activity is carried out at six sites of Msimbati, Mkubiru, Kilambo, Litembe Pwani, Hyuvi/ Mngoji and Bahasha. Data are collected once per week at each of the specified site. Each month, MBREMP staff compile the collected data using a computer package (artisanal fisheries statistics –Marine) and carry out analysis. The study has indicated a gradual increase in fish catch and fishing efforts in landing sites with which there is high compliance on legal, regulated and controlled fishery. Local community has proved to be useful in provision of baseline information, which in turn is will facilitate effective management initiatives for the Park. Collected data can be used for preparing a long term monitoring programe of the Park meanwhile assisting in reinforcing zoning scheme of the Park, as a primarily management tool for such a multiple-use Marine Protected Area (MPA).

**GLOBAL, REGIONAL AND NATIONAL SEA LEVEL TRENDS:
POTENTIAL IMPACTS FOR MARINE AND COASTAL DEVELOPMENT IN
TANZANIA**

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ABSTRACT

Global mean sea levels show a general rising trend that has recently been accelerated by global climate change caused by industrialization during the second half of the 19th century. This has been ascertained through long in-situ tide gauge records in the northern hemisphere and more recently since the early 1990s, through satellite altimetry. Although national and regional tide gauge records are not long enough to give any conclusive evidence on sea level change, the Zanzibar tide gauge station show that during the 21-yr period (1984-2004) of available data, sea level has been declining at an average rate of 3.6mm/yr. Records from 26 other stations in the Western Indian Ocean region were also analyzed, and results indicate that sea level has been rising in 15 stations whereas in the remaining 11 stations, available data portray a falling trend. Research Quality data set obtained online from the University of Hawaii Sea Level Centre (UHSLC) was used in the analysis. Another set of online data (Revised Local Reference) was obtained from the Permanent Service for Mean Sea Level (PSMSL). The SLPR2 software developed by the Joint Archive for Sea Level (JASL) was used in processing of the data. Results concur well with published results from satellite altimetry (1992-2004). However, fairly long records of at least 50 years are needed because of the influence of natural variability in the climate system. The physical and socio- economic implications of sea level change in the marine and coastal development in Tanzania, as well as the response strategies, are discussed. For a developing country like Tanzania, adaptation/accommodation is recommended as the immediate priority to respond to sea-level change. The setbacks to achieving this desire are also outlined.

**SOCIAL-ECOLOGICAL RESILIENCE OF PETE AND MARUHUBI
MANGROVE ECOSYSTEMS IN ZANZIBAR, TANZANIA**

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ABSTRACT

This paper compares the social and ecological resilience of two contrasting mangrove forests and the associated human communities of Pete and Maruhubi mangroves in Zanzibar. The roles of management regimes and institutions are assessed in relation to the attainment of robust social and ecological systems. Transects and quadrats within the mangroves were surveyed to assess the ecological state of the mangrove ecosystem, while social and economical data were collected through semi-structured interviews and discussion groups. The obtained data were collectively used for detailed resilience analysis using a conceptual framework for social-ecological resilience and the adaptive cycle. This study revealed that the mangroves of Pete and Maruhubi have been controlled by sharply contrasting management regimes, which impacted their resilience differently. The Pete forest has been seriously degraded in recent years and the mangrove ecosystem has shifted from a mature tree to stump dominated mangrove stand thereby seriously undermining the resilience of the social-ecological system, despite a purported (but not actual) collaborative management plan to which the local residents originally agreed. This situation is explained by the high degree of dependence of Pete residents on mangroves, the scarcity of other sources of income, and the Government's lack of legitimacy in the area. In contrast, in Maruhubi, where town-dwellers are not involved in the management system, the forest is flourishing and the ecosystem is shifting into a more resilient ecological state although not entirely socially desired. This has been attributed to the relative economical stability of the surrounding community who attach less value to the resources leading to a low level of dependence on these mangroves. The paper concludes with recommendations for improved management for resilience of mangroves in Zanzibar allowing local communities to play a stronger actual role in shaping management plans, including more realistic restrictions to mangrove harvesting, and more effective support from the Government for implementation of plans and development of alternative sources of income.

**ENVIRONMENTAL LAW: A GOVERNANCE AND MANAGEMENT TOOL FOR
COASTAL AND MARINE BIODIVERSITY FOR SUSTAINABLE
DEVELOPMENT IN TANZANIA.**

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ABSTRACT

Relatively few species became extinct in the 20th century as a result of environmental destruction, and therefore preservation of biodiversity was not a major problem. The situation changed radically since the 1950s; many species are now threatened with extinction or survival only in very small populations due to multiple of factors: over-exploitation, habitat deterioration, dramatic human population growth, lack of economic incentives, pollution from toxic subsistence, atmospheric and climate change. There is also very little information about the status of many categories of biodiversity especially small tropical species (micro-mammals, bats, lizards, sea/ocean fishes and mammals), due to lack of resources for research. This paper is about literature review for international, regional and national environmental instruments capable addressing biodiversity conservation, management and governance. These tri-level instruments influence each other with initiatives that begin at one level of governance often leading to similar approaches being adopted in other legal orders. The application of environmental law in Tanzania is hampered often due to a lack of trained personnel and financial resources; this undermines the effectiveness of important environmental initiatives. This calls for strengthening the application of legal instruments and mechanism through training, education campaigns coupled with management practices to ensure the use of biodiversity is both equitable and sustainable. It is evidently depicted that no state can protect her environment unaided, let alone the area beyond its jurisdiction. We vehemently argue that environmental law is an important tool in governing and managing coastal and marine resources for sustainable development for the benefit of the people of Tanzania. We finally recommend the following: Integrated Coastal and Marine Area Management in the country; academic and professional colleges/universities to establish environmental law training courses at all levels and finally NEMC should strive to implement environmental fund under EMA, 2004 to facilitate its implementation for sustainable biodiversity conservation.

Keywords: Environmental law, Biodiversity, Sustainable development, EMA 2004

**WATER RESOURCE EXPLOITATION AND LANDUSE PRESSURE IN THE
GREAT RUAHA AND LOWER RUFJI CATCHMENTS OF THE RUFJI RIVER
BASIN**

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ABSTRACT

The Great Ruaha sub-catchment with a total area of 84,000 km² is the largest of the four sub-catchments of the Rufiji river basin. The other three sub-catchments of the Rufiji basin and their total areas respectively are: Kilombero (40,000 km²), Luwegu (26,000km²) and Lower Rufiji (19,215 km²). Three main tributaries, Ruaha (of the Ruaha catchment), Kilombero (of the Kilombero sub-catchment) and Luwegu (of the Luwegu sub-catchment) supply 15%, 62% and 18% of the Rufiji river of the Lower Rufiji sub-catchments. The Rufiji river which draws its water from the above three tributaries, has the mean annual mean discharge of $30 \times 10^9 \text{ m}^3$. In the Ruaha sub-catchment, water, arable land and grass forage are perhaps the most important resources supporting the livelihoods of people. These resources had been the major driving forces for the socio-economic developments of the local communities and over all national economic developments. In particular, the irrigation water abstraction at Usangu plain of the Great Ruaha catchment has increased six times during the last 50 years. The rapid population growth at Usangu plain has been paralleled with growth of the total cultivated area, growth of irrigated land and growth in livestock number. These changes were in turn paralleled with the changes in dry season flow in the Great Ruaha river, decreased seasonal flooding of the western wetland at Usangu plain, decreased dry season flows in some tributary rivers at Usangu. Further abstraction of water is taking place downstream of the Usangu plains, where two reservoirs were commissioned, the Mtera and Kidatu during 1980's and 1970's respectively. The Mtera and Kidatu contribute about 50% of the national hydropower supply. Further future abstraction of water for irrigation and impoundment of water for hydropower generation are planned at the Lower Rufiji sub-catchment. The abstraction of water for irrigation developments, impoundment of water for hydropower developments together with the livestock expansion along the Great Ruaha, seem to undermine the importance of the coastal and marine environments and its ecological biodiversity.

**THE DISTRIBUTION OF CRABS AND MOLLUSCS IN THE KUNDUCHI
MANGROVE FOREST, DAR ES SALAAM**

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ABSTRACT

The studies of different mangrove stands and their associated fauna are not only fundamental for understanding their ecology but also are important for monitoring, management and conservation of mangrove ecosystems. The influence of different mangrove species on the abundance and species composition of crabs and molluscs were investigated in the four different stands at the Kunduchi mangrove forest, Tanzania. Four study stands (*Avicennia marina*, *Ceriops tagal*, mixed species and cleared stands) were established in which a total of 7 crab and 4 molluscan species were recorded during the study period. There was extremely significant difference in total mean fauna abundance among four stands ($F_{(3, 36)} = 20.214$; $p = 0.0001$). The higher total mean abundance of 1,134 individuals per m^2 was recorded at mixed species, *Ceriops* being the second with 547 individuals per m^2 , whereas, the lowest (204 individuals per m^2) was found in the *Avicennia* stand. Likewise, the greatest mean biomass of 36.9 g per $1 m^2$ for molluscs was recorded in the *Ceriops tagal* dominated stand, while no molluscs observed in the cleared stand. The number of taxa, evenness and diversity of crabs and molluscs for each stand were calculated using the Shannon-Weaver index. *Ceriops tagal* supported very significantly greater faunal species diversity of 0.55, followed by 0.34 of mixed mangroves stand, and then *Avicennia* with 0.17, whereas, the cleared stand was having significantly the lowest species diversity of 0.03. Moreover, the mixed mangrove species stand supported a greater number of faunal species due to its varied micro-habitats and food availability, while the saplings are thought to be a better food source than those of mature trees.

Key Words: crabs, molluscs, mangrove stands, abundance, species composition

POSTERS

1st TANZANIA COASTAL & MARINE FORUM

MARICULTURE AS A BUSINESS

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ABSTRACT

Coastal aquaculture development in Tanzania has caught the attention of business developers, research institutions, government and NGOs. At a National Division of Fisheries meeting in January 2007, Minister of Natural Resources and Tourism, Professor Jumanne Maghembe, mentioned aquaculture development as a priority issue for Tanzania. ACDI/VOCA's USAID-funded Sustainable Environmental Management through Mariculture Activities (SEMMA) Project in Tanga has been promoting aquaculture activities in the Region since 2003. Mangrove crab cage culture was cited as a high potential commodity for the Tanga Region, and in early 2005, in partnership with Ms. Elgin Arriesgado a VSO Mariculture expert from the Philippines based in Mombasa at KWETU Training Center for Sustainable Development and Coral Reef Degradation Indian Ocean (CORDIO), and SeaProducts, Ltd., a Tanga-based marine product exporter, the SEMMA project began a mangrove crab cage culture trial here in five coastal villages over a 12-month period. In conjunction with the village-based field trials, SEMMA project coordinated a value chain analysis of the mangrove crab industry in Tanzania and a commissioned TAFIRI to conduct a natural stock assessment of mangrove crab and other high potential mariculture species in the Tanga Region. Assessments were conducted throughout the trial to ascertain the economic viability and identify environmental impact of the activity. The trials provided valuable information on cage culture management, grow-out period. Villagers participated in basic business training, as well as technical training. The value chain analysis provided analysis of the industry including growth potential, and the subsequent stakeholder meeting provided opportunity to validate the findings with producers, exporters, hoteliers, bankers, brokers and district officials. In 2006, the crab cage culture expanded to a total of nine villages. The field trials provided opportunity to develop best practice guidelines and opportunity for strengthening partnership between the producers and the exporters. SEMMA staff members have conducted study tours for several groups to promote the expansion of the crab cage culture activity in other suitable coastal areas.

**ADDING VALUE TO SHELL-FISHERIES IN TANZANIA-
jewellery and shell craft at Fumba**

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ABSTRACT

Most of the coastal women in Tanzania traditionally are very active in shell fish collection (both bivalves and gastropods) especially during spring tides. These are used both for subsistence and for sale. Once the meat has been extracted the shells are usually thrown away. It is a common site therefore to see heaps of these shells dumped in bushes along the coast or littering the beaches. A recent attempt has been made to use these shells for jewellery making. This activity is done elsewhere in other parts of the world and has proven to be of great benefit in improving community livelihoods. The work involves collection of the used shells, cleaning them and then grinding to get a good luster. This is followed by cutting them in shapes and making ornaments which can be sold to local communities and to tourists. This paper elaborates on the preferred species for making the ornaments and discusses the issue of how to make this activity sustainable through education and awareness programmes in both environmental issues as well as marketing.

THE PROSPECTS OF PEARL FARMING IN ZANZIBAR, TANZANIA

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ABSTRACT

Several species of pearl oysters which are marine bivalves such as *Pinctada fucata*, *P.maxima*, *P.margaritifera* and *Pteria penguin* are used for pearl culture world wide. In Tanzania the species tried so far are *P.fucata*, *P.margaritifera* and *Pteria* sp. Procedures used in pearl farming consist of collection and preparation of the host shellfish, nucleus insertion and cultivation of mother oyster. Pearl farming is a new activity in Tanzania which started in the early 2000s in Mafia Island using *Pinctada* sp. In Zanzibar this activity started in 2006 and is progressing well. Major problems facing future pearl culture is security and good culture ground, and preservation of their environmental conditions. This paper will elaborate on the culture technique that has been used in Bweleo village in Zanzibar using floating lines and the bivalve *Pteria*. It will also present information on the process made so far in finding the bivalves, determining some of the environmental parameters taken in the vicinity where the rafts have been put together, the survival rate, spat production around the area (which is very important in ensuring sustainability of the activity) and nacre deposition on these pearls. As a result of these studies, there are good prospects for pearl farming in Tanzania as the community has already shown a keen interest in this activity which could be one way of assisting in increasing their economic status thus improving their livelihoods.

**THE PROCESSES AND SCALE OF POLLUTION ALONG THE
COASTS OF DAR ES SALAAM AND ZANZIBAR MUNICIPALITIES**

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ABSTRACT

High marine pollution in coastal urban areas as a result of rapid population growth and economic activities is no longer a hypothesis. Because of their location, Dar es Salaam and Zanzibar are amongst the most marine polluting urban centers in Tanzania. Sporadically distributed studies on marine pollution in Tanzania indicates the presence of hazardous ingredients in both Dar es Salaam and Zanzibar. This study was intended to establish distribution and extent of pollutants on Tanzanian coastal ecosystems. Such information is crucial for establishment of better pollution management strategies. Sampling of water, sediment and biota was done in nine sites in Zanzibar namely, Mtoni, Bawani, Harbours, Institute of Marine Sciences (IMS), Shangani, Africa House, Mnazi mmoja Hospital, Kizingo and Kilimani. were chosen in Zanzibar basing on their closeness to sewage outfalls in the subtidal. In Dar es Salaam, five sites were chosen. These are, Mbeni, Salender bridge, Ocean Road, Port and Kizinga River mouth. At each site, insitu analysis of pH, dissolved Oxygen (DO), salinity and temperature was done. Samples for Sediment Oxygen Demand (SOD) and Biological Oxygen Demand (BOD), Nutrients, coliform and pesticides were collected and analyzed following standard methods. Further analysis of heavy metal and pesticides in sediment, water and biota samples is going on. Preliminary results obtained so far show presence of sewage pollution in all cities of Zanzibar and Dar es Salaam except in Mbeni site of Dar es Salaam. Low levels of pesticide pollution were also found in all cities of Dar es Salaam. Among the surveyed sites surveyes, Ocean Road sites in Dar es Salaam is the most sewage polluted. According to the results of this study, there is a pressing need of sewage treatment otherwise our marine creatures and human health will be highly affected especially those which are closer to the cities.

THE IMPORTANCE OF THE CRUSTACEANS AND MOLLUSCS TO THE HOUSEHOLD SOCIOECONOMIC WELFARE IN MAFIA ISLAND

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ABSTRACT

In recent years, fishing has become more significant on the coast of East Africa generally and on Mafia in particular and has also been commercialized to a large extent. Although fin-fish are important both in terms of local consumption and export, it is crustaceans (such as lobsters, prawns and crabs) and molluscs (such as squid, snails and octopus) which fetch high prices and which are increasingly in demand for export and local consumption through increasing tourism, tourist hotels and the increased population. Despite the recently established companies in Mafia Island, that buy and export commercially important species of molluscs and crustacean from the local fishing communities, and of tourist hotels which provide local markets, no studies have been done to assess the importance of crustacean and molluscs to the household socio-economic welfare. Key informant interview with fisheries officers and village leaders, focus group discussions with collectors and divers, participant observation, and secondary data were used to give information on general aspects and specific issues related to the importance of the crustaceans and molluscs to the household socioeconomic welfare in Mafia. The study identified that the collection and diving activities (fishing) is done mainly as a source of income, food and ornamental purposes. Further discussion with people who were engaged with diving fishing revealed that the diving contributed about 80% of the household income. Majority of divers and collectors of marine animals at the study are poor. Few who are ranked as rich were mentioned to own 3 to 4 traditional fishing vessels, have good traditional houses, own few livestock (cows), and also own bicycles and radios. It has also been reported that, rich divers (those have dived for about 10 years) and collectors are secured in terms of food throughout the year. Octopus, squids, lobsters and mangrove crabs are sold to the middlemen who in turn sell to the export companies (e.g. TANPESCA). While those animals collected by women and children are used for home consumption and also sold to local individuals and at the local brew shops. This study therefore provide baseline information on the importance of crustaceans and mollusks to the household socio-economic welfare in Mafia island, which will generate a set of recommendations for improving policy frameworks and market strategies for the sustainable utilization of these resources and development of coastal communities.

**ROLE OF MANGROVE FORESTS TO HOUSEHOLD FOOD SECURITY IN
TANGA MUNICIPALITY, TANZANIA**

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ABSTRACT

The study to assess role of mangrove forests to household food security was carried out in Tanga Municipality in 2006. Specifically the study among other things 1) assess goods and services provided by mangrove forests 2) assess contribution of mangrove forest to household food security 3) assess role of women and men in decision-making regarding sustainable mangrove forest management. Data were collected through participatory rural appraisal and questionnaire survey. Three villages were purposively selected based on livelihood dependence on mangrove ecosystems. Stratification sampling design was employed to obtain a representation of households who are involved in mangrove resources activities for questionnaire survey in each study village. The sample involved 60 respondents, 20 from each village. Checklists were used to interview Regional, District and Local Forest Officers and village leaders to solicit more information about the study. It was found that availability of mangrove resources in the study area helps to serve household food security in two ways. They are collected for direct consumption and sold to generate income for food purchase or other household expenditure. Amount of mangrove resources consumed in a daily basis and or season was taken as indicator of direct contribution to household food security in the study area. Indirect contribution of mangrove resources to household food security in this study refers to the sale of mangrove resources to generate income, which is then used to purchase food and other household requirements. Socioeconomic factors associated with harvesting of mangrove resources included population increase, age, health status, and effort to look for resource, collapse of sisal estate, poverty and lack of livelihood options. Both male and female are involved at decision making regarding sustainable management of mangrove forest resources. Further study should be carried out to assess other services and attributed provided by mangroves for household food security.

SEAWEED FARMING IN MAKUNDUCHI AND UROA ZANZIBAR: what future does it have?

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This research is a study of seaweed (*Kappaphycus alvarezii*) cottonii and (*Eucheuma denticulatum*) spinosum cultivation and marketing in the villages of Makunduchi and Uroa, Zanzibar. The aim of this study is to provide a general view of the historically background on the development of seaweed farming in Zanzibar, the current situation and its effect to the well being of the peasants living in these areas in the last 15 years and what is in store for the future of this activity. The methodology used in the study involved review of secondary data, structured questionnaire interviews, informal interviews and focus group discussions and observations. The target population group were women and a few men involved in farming, a total of (110) people were interviewed, randomly selected from each region, Three agents (companies) and one (1) village Sheha were also interviewed including some Fisheries Department personnel. The findings of the study discovered that: seaweed cultivation still exists but have changed its status; most of the men have abandoned the production and prefer fishing or agriculture rather than seaweed farming. Farmers are faced with problem of market. The seaweed selling price is not equivalent to the agents buying and export price. However, recently the government raised the buying price from 110 Tsh for the seaweed *E.spinosum* to 160 Tsh and 220 Tsh for *E. cottonii* to 250 Tsh. Further more the farmers have no direct access to the world market. The study also found that there has been a huge exportation of seaweed compared to the actual tonnage reported between (1992- 2002). This is an area that needs to be examined further.. Also the study discovered that, there emerged a disparity between the direct value of a commodity and its price of production, the existing of classes between producers (farmers) supplier (agents) and buyers (small enterprises and companies).The agents are the ones who benefit most while the farmers are the losers despite the fact that they earn some money out of this business. From the limited findings of this study it has been shown that seaweed farming at Makunduchi and Uroa has a significant impact with respect to the disparity that has affected the well-being of the farmers. The study suggests that intervention measures such as provision of education, extension services to add value to the product still needs to be done. Also credits should be supplied to the farmers as now they have to purchase their own farming implements.