



UNITED NATIONS ENVIRONMENT PROGRAMME

*Coastal and marine
environmental problems of
the United Republic of Tanzania*

UNEP Regional Seas Reports and Studies No.106

Annexes

UNEP 1989



PREFACE

The Government of the United Republic of Tanzania approached UNEP in late 1987 with a request for assistance in assessing the coastal and marine environmental problems of the country and in drawing up a national action plan for the protection, management and development of its marine and coastal environment.

In response to this request, and in close co-operation with the Tanzanian National Environmental Management Council (NEMC), a mission was organized by UNEP. The terms of reference of the mission was to:

- review the status of the United Republic of Tanzania's capabilities in the field of marine sciences including the identification and description of national institutions engaged in marine science and pollution studies;
- survey coastal and marine living resources;
- identify species, habitats and ecosystems that may require protection in order to:
 - (i) maintain essential ecological processes and life supporting systems and the preservation of genetic diversity;
 - (ii) ensure the sustainable utilization of living resources;
- identify possible sites for the establishment or improved management of specially protected areas such as marine parks and reserves;
- identify major sources of marine and coastal pollution and assess the present levels of marine pollution in the coastal areas including identification of changes in the environment that may be ascribed to pollution; and
- make an inventory of major ongoing and planned development activities which have or may have an impact on the quality of the coastal and marine environment.

The surveys were undertaken in late 1987. They were carried out in consultation with local experts, to ensure that proper consideration was given to local, regional and national problems and priorities in the drafting of the National Action Plan.

The report consists of a summary describing specific coastal and marine environmental problems of the United Republic of Tanzania such as, coral reef destruction, mangrove cutting, fisheries over-exploitation and unnecessary intrusion in and disturbance of marine reserves. This summary is based on six sections on various regions of the United Republic of Tanzania, with their findings and recommendations; and of a proposed Action Plan for the protection, management and development of the marine and coastal environment of the United Republic of Tanzania, developed in the context of the regional Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region.

Dr. M. Pearson (Institute of Marine Science in Zanzibar) carried out the surveys and wrote the six sections of the report. Mr. P.K. Akiwumi prepared the consolidated report. The assistance of the national authorities and counterparts of the United Republic of Tanzania is gratefully acknowledged.



CONTENTS

	Page	
ANNEX I	REPORT ON THE TANGA REGION	1
ANNEX II	REPORT ON THE COAST REGION	15
ANNEX III	REPORT ON THE DAR ES SALAAM REGION	23
ANNEX IV	REPORT ON THE LINDI REGION	31
ANNEX V	REPORT ON THE MTWARA REGION	41
ANNEX VI	REPORT ON ZANZIBAR	45
ANNEX VII	MARINE RESERVES	59
ANNEX VIII	ENVIRONMENTAL LEGISLATION	61
ANNEX IX	TABLES	75
ANNEX X	FIGURES	89
RERERENCES		113

INTRODUCTION

The Tanga region (Figure 1, annex X) extends from the Kenya border to a point just north of Mligasi River. In addition to the Mligasi River, the coastal area receives the Msangasi, Pangani and Sigo Rivers, these originating from two watersheds; the Pangani and Wami draining a combined 101,643 km² (Figure 5, annex X). The Wami River though draining into the sea south of the regional demarcation influences the coastal ecosystems of the Tanga region due to a continuous northerly flowing current of 1/2 to 4 knots depending on seasonal factors and climatic conditions. The coastal zone is much indented, having a complex system of bays and islands to the north and a partial barrier of reefs and islands from 1-5 nm offshore extending just south of Pangani.

There are two urban centres, Tanga, the regional headquarters and Pangani, a small fishing and agricultural centre.

The survey of the Tanga region included a representative sample of all marine environments and the urban area including an assessment of industrial development on the coastal zone. The information presented below is a digest of observations and the result of discussions with regional officers.

1. MARINE ENVIRONMENTS

1.1 CORAL REEFS

Coral reefs and fringing reefs around offshore islands were observed and their conditions assessed. These included from north to south: Boma Reef, Mwamba Shundo, Mwamba Wamba, Fungu Nyama, Niule Reef, Yambe Island, Karange Island and Fungu Tongone.

(a) Boma Reef

A reef situated 0.45 nm off Boma Peninsula. A large drying section with a sand bank, and a channel between the reef and the mainland with a minimum depth of 7m is exposed at low water spring. The sand bank spreads towards the mainland coast, indicating that current flow is stronger to seaward, in a northwesterly direction. During the period of observation, the visibility was approximately 6m and the sea calm.

Status

During the survey, 19 coral genera were observed, the dominant species being the Acropora spp. and Galaxea spp. with the main frame building corals being Favia spp., Porites spp., Pavona spp., and Galaxea spp.. Observed coral cover was 15% with little evidence of juvenile specimens, when seen, these were predominantly Pocillopora spp.

Impacts

The area has been severely damaged by dynamite, this is evident by the presence of fractured massive frame building coral colonies, craters and rubble patterns. In addition, the damage has been exacerbated by anchoring techniques employed by artisanal fishermen. Fishermen using anchors carved from limestone (pleistocene coral reef) crush and drag coral colonies when anchoring over their fishing grounds. As the anchors drag over the coral substrate, they push coral rubble before them. This then falls down the fore reef slope, damaging deeper corals which would otherwise be immune to the immediate effects of explosive fishing. Further impacts may be

due to storm damage and reef walking by fishermen at low tide. The latter is a common practice on all Tanzanian reefs and tidal flats and constitutes an important element of the artisanal fishery, for molluscs and octopus. (Table 13, annex IX).

Potential for recovery

With efficient control measures, recovery is possible given the presence of good substrate for attachment and the existence of juvenile colonies.

(b) Mwamba Shundo

Mwamba Shundo is a coral reef lying 6 nm offshore within the 100 fathom line which lies 0.5 nm to seaward.

Status

The coral reef is 2.5 nm long and 0.4 to 1.2 nm wide. The area observed was 1.0 nm from the southern tip. The structure consists of a narrow fringe of coral, forming a reef flat that does not dry during spring tides but has a minimum depth of less than 1 m. Towards the west off-lying patch reefs 10 to 20 m in depth rise to a maximum depth of 1 m at low water springs. There is a slope of 35° to 45° to the west which starts at the 10 m depth contour.

Impacts

The reef shows evidence of dynamite damage but has also been subject to storm surge damage. It is possible that through the use of dynamite, the structure of the reef has been altered and that damage due to storm surge is increased due to the movement of fractured colonies that then impact attached living colonies. The back reef slope was covered by calcareous algal rubble. Close observation did not reveal any coral cover. It was surmised that these may in effect be separate calcareous algal units that tumble during heavy weather conditions and hence do not adhere to each other. This surface having no visible cementation was judged unsuitable for coral attachment. The reef crest had previously been colonized by massive colonies but has since been colonized by encrusting growth forms. The main frame building genera seen were Porites spp., Pavona spp., Favia spp. and Montastrea spp., but few living specimens remain. During the survey 19 genera were observed, of these the Acropora spp. and Galaxea spp. were dominant. Maximum cover was 20% in 3,000 m² observed.

Potential for recovery

This reef is located some distance from the inshore coastal fishing grounds but is subject to severe storm conditions during both the north and south monsoons. With the present use and pressures on the reef, the prospects for recovery are slight.

(c) Mwamba Wamba

Mwamba Wamba is one of the designated reefs that form part of the proposed Tanga Coral Gardens Marine Reserve. It is a large reef and only the southwestern section consists of a fore reef area. Reef crest and back reefs were observed. The fore reef consisted of a climax of Galaxea spp. stands interspersed with Pavona spp., Porites spp., Favia spp. and associated species. There is a sharp drop from the reef crest to a sandplain at 10 m, and several patch reefs of similar structure were seen to seaward of the principal reef formations. The back reef, also previously covered primarily by Galaxea spp., extends for approximately 0.1 nm.

Status

Nine coral genera were observed on the fore reef area none of which occurred in large numbers to be considered dominant. On the reef flat and back reef area the same situation existed, but 17 genera were seen to be represented. Coral cover was less than 5% on the fore reef slope and between 5 to 10% on the reef flat and back reef areas.

Impacts

The entire area surveyed has been severely damaged by explosive fishing and by artisanal anchors. Primary damage has been due to explosive fishing, consequently movement of columnar rubble from damaged Galaxea spp. colonies by stone anchors has caused damage to the entire fore reef slope. It is also possible that Acanthaster planci (Crown of Thorns Starfish) may have been present in large numbers, and this may have contributed to the observed mortality. During the survey seven specimens of Acanthaster were seen, a larger number than on any other coral reef surveyed in Tanzania. It has been reported that localized population explosions of Acanthaster have occurred in Zanzibar, the most recent being in 1979.

Potential for recovery

It is the opinion of the consultant, based on the observations of the current conditions, fishing pressure and use of explosive fishing techniques, that the potential for recovery of this reef is poor.

(d) Fungu Nyama

Like Mwamba Wamba this reef was also proposed to form part of the Tanga Coral Gardens Marine Reserve. Fungu Nyama is a large coral reef formation drying at low water springs with sand bank formations drying to 3 m.

Two areas were observed. Firstly, the fore reef which consisted of a sloping coral platform at 10 to 15 m in spur formations bounded by sand channels. No living coral was observed, and concomitantly no fish were seen. The coral surface seemed to have been scoured reducing the available habitats for fish species associated with reef formations. The surface was similar to that observed in Jamaica following the passage of Hurricane Allen (1981); the reef surface was devoid of settlement and rubble accumulations were seen in the sand channels.

Secondly, the back reef area over a distance of 0.7 nm parallel to the reef crest was observed. The structure typical of back reef areas was once luxuriant and had a high diversity of coral species.

Status

Coral diversity was good with 21 genera represented, but as in the other reefs observed, the coral cover was low with a maximum of 15%. The density of living specimens in the area surveyed was also extremely low. Unlike other reefs observed, the molluscan species were well represented with Conus spp., Lambis spp., Strombus spp. and Cyprea spp. Two specimens of Acanthaster planci were seen, and these were feeding on Acropora spp. colonies. The dominant coral species on this reef were the Acroporiids and may also be the dominant species recolonizing the reef since juvenile specimens were observed. No major frame building coral was seen in their juvenile stages.

Impacts

Extensive and continued use of explosive fishing techniques has reduced much of the substrate normally suitable for recolonization to unconsolidated rubble. This rubble is now

colonized extensively by soft coral species, inhibiting the possible settlement of the more energetically important scleractinian species. Artisanal fish traps were also seen to cause damage to the remaining coral colonies with traps being selectively dropped on or in the vicinity of living coral.

Potential for recovery

Since this reef is easily accessible to the artisanal fishermen who were observed to using dynamite, the potential for recovery is slight.

(e) Niule Reef

This reef is the third reef designated to form part of the Tanga Coral Gardens Marine Reserve and is the most accessible to Tanga. The area observed was at the northern pass close to Niule light. The reef is fronted by a large reef crest that dries to 1 m during low water springs. The area covered was 1,000 m².

Status

The area is covered by dense concentrations of Ulva and Sargassum, both growing on broken coral substrate. In the deeper areas surveyed, patches of Thalassia were seen, but here as in the coral areas evidence of dynamite blasts were seen.

Impacts

Explosive fishing damage has been very extensive, and only two living coral colonies were seen in the area surveyed. These were a Pocillopora spp. and a colony of Stylophora pistillata, both on broken coral substrates. The reef flat areas have been observed to be under intense fishing pressure during low tides with 30 to 40 fishermen observed searching for octopus and mollusc species, both during the day and night.

Potential for recovery

With the lack of suitable substrate for settlement, continued pressure and explosive fishing techniques, resettlement and growth of scleractinian corals seem extremely unlikely. The possibility of resettlement being slight only if the area were isolated and a suitable genetic pool existed downstream of this reef. There was, however, no genetic pool identified during the survey.

(f) Yambe Island

The survey of the southern part of the inward reef adjacent to this island was observed by scuba diving. The area consisted of a series of patch reefs separated by sand, rubble or silt channels. The silt channels being predominantly to the south and the rubble towards the north. The patch reefs rose from a depth of approximately 10 m to within 2 m of the surface.

Status

The patch reefs observed were represented by 32 coral genera with the dominant species being variable on each patch reef. However, the main frame building corals were Galaxea spp., Porites spp. and Pavona spp.. Coral cover was variable with a minimum of 5% and a maximum of 60%, the latter being single species patches of Galaxea spp. or Pavona spp. undamaged by either explosive fishing or improper anchoring. Regeneration was seen in damaged areas when they were not dominated by Galaxea spp. or Acropora spp. rubble. They seem to provide an inadequate substrate for resettlement. Regeneration by Pocillopora spp., Acropora spp., Galaxea spp. and

other encrusting species was seen in areas previously colonized by Pavona spp., Porites spp., Favia spp. and Diplocestrea spp. Regeneration was not, however, seen in areas recolonized by soft coral species, which have a faster growth rate and tend to reduce available substrate for settlement and overgrow juvenile colonies. In severely damaged areas soft coral cover was estimated at 60 to 80%.

Impacts

The patch reefs have been exposed to explosive fishing, with recent impacts observed. Sediment load was high and visibility poor. Coated sponges of the Siphonales spp. and corals of all species were unable to clear surface sediment. The latter were seen to be covered by a mucus sheath and showed evidence of bacterial infestation (Black Band Disease).

Potential for recovery

Given the diversity observed and the existence of undamaged patch reefs, damaged areas could be recolonized by the scleractinian species. But sediment loads are persistently high, and this in combination with overgrowth by soft coral colonies may reduce this potential. A further quantitative survey may classify the area to be suitable for isolation as a genetic reserve.

(g) Karange Island

The northern coast of Karange Island on the leeward side of the island was surveyed. The coastal strip was covered by dense mangrove forest of mixed species. The island consists of a series of uplifted pleistocene reef formations dissected at two places (north and south) by a pass which dries at low water. Three transects were run from the shore to a depth of 10 m, a distance of approximately 0.2 nm. In all cases, cover was similar following the same zonation patterns from shore to the maximum observed depth.

Status

Close to shore on a muddy substrate were dense stands of Thalassadendron interspersed with detached colonies of Goniopora spp., Seriatopora hystrix and Stylophora pistillata. The latter two were attached to hard substrate of some unidentified massive coral colonies. This area has begun to be colonized by soft coral forms.

To seaward of the seagrass and coral zone is an area previously colonized by a good cover of massive frame building corals long dead and subjected to normal bioerosional processes. The upper surfaces are now heavily colonized by soft corals both branching and encrusting. Little surface was available for the settlement of scleractinian species. The bioerosional processes have created micro-environments in crevasses and excavations, these areas are now colonized by new scleractinian growth of good diversity decreasing markedly to 5% or less, below 8 m. The dominant species over the entire area surveyed were Galaxea spp., Pavona spp. and Acropora spp..

Impacts

This reef is subject to heavy sedimentation which may account for decreased coral cover with increasing depth. It was seen that colonies with surface lesions were unable to clear sediments adequately, while uninjured colonies were well cleared. This observation tends to suggest that the corals are under continuous stress and that the system is inherently unstable. Sediment loads originate from the Pangani River and are transported north within the boundary of the off-lying reefs and islands. The sediment is then held and concentrated in the basin bounded on the east by Karange and Yambe Islands and on the west by the mainland of Tanzania.

Explosive fishing damage was seen to increase towards the northern part of the area observed. Damage attributed to explosive fishing was compounded by mangrove poles crushing and

abrading coral surfaces. The poles are cut illegally in the center of Karange Island and transported by canoe (Ngalawa) to the mainland. These canoes are overloaded and shed their load onto the reef in heavy weather.

Potential for recovery

A reduction in sediment load by improved agricultural techniques and reforestation of the banks of the Pangani River should reduce stress factors and allow for the growth and resettlement of scleractinian species on the reef observed. The isolation of this area and control of logging operations on the island could stabilize this reef which could then serve as a genetic source for the resettlement of reef areas to the north (i.e. Yamba Island).

(h) Fungu Tongone

Fungu Tongone is an isolated sand bank fronted by an extensive fringing reef to seaward with a well developed back reef and off-lying patch reefs to leeward. The sand bank and the reef crest dry to 6 m and 1.5 m respectively during low water springs.

Status

The fore reef slope was observed to a depth of 10 m, no evidence of explosive fishing was seen, and coral cover was good at 45%. Normal reef zonation for a high energy reef was observed with little growth in shallow areas and a downward shift of all colonies with extensive growth and cover of Acroporiids spp. starting at 6 m. This area was fronted by massive frame building corals dominated by Porites spp., Pavona spp. and Diploastrea spp. Undamaged coral was seen to extend beyond the 10 m depth contour.

The back reef area was dominated extensively by Zostera and Thalassodendron spp. patches in the shallows. To seaward of the seagrass zone was a shallow slope covered by patch reefs of good diversity, 20 coral genera were observed, however, the cover was poor.

Impacts

The back reef area has been subjected to heavy explosive fishing, evident by distinct craters.

Potential for recovery

The reef is under continuous fishing pressure both with traditional and explosive techniques. Beach seining operations were observed to cause damage to bottom fauna and anchoring techniques, using traditional stone anchors have added to the damage caused by explosive fishing. The sediment load is also very high reducing light penetration on the back reef areas. Considering these factors, the potential for recovery of the back reef area is slight while the comparatively undamaged fore reef slope is subject to normal development patterns.

1.2 MANGROVES

The Tanga region has extensive mangrove cover in the Sigi River Delta, the bays and islands to the north of Tanga towards the Kenya border, Yambe and Karange Islands and the Pangani River Mouth.

In all areas visited, mangrove cutting was observed, most of the cutting is carried out without permits for use as building materials and firewood, some for export, but cutting of larger specimens is being carried out selectively by independent operators supplying the salt industry. There was no information available on the tonnage cut or the area cleared.

Mangrove areas in the vicinity of the Tanga urban limits are subjected to both cutting (which has led to coastal erosion of land fronting residential areas) and pollution from industrial and urban sources. The planned development of Tanga to the year 2005 does not take into account the importance of mangrove stands as biological units or as coastal stabilizers. Zones of industrial and urban development have been planned in areas fronted by mangrove forest, but no treatment facilities have been planned for the former, with effluents being discharged directly into watercourses leading to mangrove areas.

1.3 SEAGRASS BEDS

Extensive seagrass beds were found in all bays investigated and on the western side of all reefs and islands lying off the mainland coast. The dominant seagrass genera are Cymodocea, Thalassia and Thalassodendron and all are subjected to heavy artisanal fishing pressure by traditional techniques including bottom traps (Madema) and beach seines. The latter, as noted previously, causes considerable damage to bottom flora and fauna. Explosives fishing is also being carried out on seagrass areas, but here, unlike coral areas, the damage is restricted to compact craters with little apparent damage to adjacent areas. The lack of hard substrate seems to allow the shock waves from the explosion to pass unimpeded, while coral substrate form barriers to the waves and are broken.

The diversity and density of fish species normally found on seagrass areas were absent in all areas investigated, supporting the previous observation of excessive fishing pressures.

Apart from those genera of seagrass observed all coral areas and drying reef flats were covered by extensive stands of Sargassum, and Ulva. Samples of Euchema were also found suggesting the possibility of a natural stock of Euchema for mariculture development programmes in selected embayments.

1.4 FISHERIES

Artisanal fishing though an important activity of the coastal population of the Tanga region has contributed to the severe degradation of the marine environment with reduced catches already apparent (Table 1, annex IX).

Data from the Statistics Gathering Programme of the Fisheries Division of the Ministry of Natural Resources and Tourism show that there has been a decrease in landed catch with a slight increase in the number of fishermen and gear from 1985 to 1986. Table 1, annex IX, also shows the breakdown of gear and the number of fishermen for the year 1984 to 1985 with some values presented for 1986. Table 2, annex IX, gives a further account of the fisheries statistics from 1970 to 1986, showing the downward trend in catch per fisherman from 1981 to 1986.

From the data represented in table 2, annex IX, it can be seen that since 1981 there has been a decrease in the total catch per fisherman per year. When the composition of the total catch is analyzed, it shows that the major component of the landed catch has shifted from inshore demersal fish normally found on reefs and coastal areas to pelagic species, present and migrating in the offshore fishing grounds. The data corroborates with the observations, that the density and diversity of reef fish species have declined due to explosive fishing, improper anchoring techniques and careless fishing methods. The data also suggest that the resource base and productivity associated to coral reef areas has been reduced, possibly creating serious long term effects on the fisheries potential of the area.

Recommendations

The recommendations for improving the artisanal fishery sector are an integral part of the Action Plan. Adoption of the Action Plan will in time result in increased productivity, a