



UNITED REPUBLIC OF TANZANIA
MINISTRY OF LIVESTOCK AND FISHERIES DEVELOPMENT

TANGA COELACANTH MARINE PARK

GENERAL MANAGEMENT PLAN



BOARD OF TRUSTEES
MARINE PARKS AND RESERVES UNIT

September 2011



TABLE OF CONTENTS

ACKNOWLEDGEMENT	iv
PREAMBLE.....	v
APPROVAL PAGE.....	vi
VISION, MISSION, MOTTO.....	vii
ACRONYMS	viii
FOREWORD	ix
EXECUTIVE SUMMARY	x
CHAPTER 1. INTRODUCTION.....	1
1.1. Why a General Management Plan.....	1
1.2. Target Audience of the General Management Plan.....	1
1.3. Historical Development of Tanga Coelacanth Marine Park.....	2
1.4 Significance of TACMP	3
CHAPTER 2. RESOURCE DESCRIPTION AND USE	4
2.1. Area and Location.....	5
2. 2 Physical Features.....	5
2.2.1. Geology and Topography.....	5
2.2.2. Bathymetry.....	5
2.3. Climate	6
2.3.1. Weather Conditions	6
2.3.2. El Niño - Southern Oscillation.....	7
2.4. Oceanography.....	7
2.4.1. Currents	7
2.4.2. Tides	7
2.4.3. Surface Water Temperature.....	7
2.5. The Natural Environment	8
2.5.1. Mangrove Forests	8
2.5.2. Muddy Shores / Mud Flats.....	9
2.5.3. Seagrass Beds	9
2.5.4. Rocky Shores and Macro-algae / Seaweeds.....	10
2.5.5. Coral Reefs	10
2.5.6. Phytoplankton	11
2.5.7. Fish Community Structure and Populations.....	11
2.5.8. The Coelacanth, <i>Latimeria chalumnae</i>	12
2.5.9. Invertebrates	13
2.5.10. Marine Turtles	14
2.5.11. Marine Mammals	15
2.5.12. Shorebirds.....	15
2.6. Human Activities and Natural Resource Use	16
2.6.1. Socio-economic Context.....	16
2.6.2. Artisanal Fishery	16
2.6.3. Shore-based Collection (Gleaning).....	17
2.6.4. Fish Processing and Trading	17
2.6.5. Agriculture and Livestock Keeping.....	18
2.6.6. Mariculture	18
2.6.7. Mangrove Harvest and Beekeeping	19

2.6.8. Salt Production.....	19
2.6.9. Coral Mining and Mineral Exploitation.....	19
2.7. Cultural Heritage.....	19

CHAPTER 3. MANAGEMENT ISSUES AND OPPORTUNITIES..... 20

3.1. Natural Resource Issues	20
3.1.1. Destructive and Illegal Fishing Practice.....	20
3.1.2. Fishing Pressure and Unregulated Fishing.....	22
3.1.3. Endangered Species.....	22
3.1.4. Unsustainable Mangrove Harvest.....	27
3.1.6. Beach Erosion and Pollution.....	27
3.2. Socio-economic Issues	23
3.2.1. Market Access and other Post-harvest Operations.....	23
3.2.2. Income and Access to Financial Capital.....	23
3.2.3. Access to Equipment and Technology.....	24
3.2.4. Education and Training.....	24
3.2.5. Unemployment.....	24
3.2.6. Governance, Enforcement and Compliance	25
3.2.7. Transportation and other Infrastructure.....	25
3.2.8. Seasonality.....	25
3.3. Opportunities	25
3.3.1. Livelihood Enhancement	25
3.3.2. Tourism.....	26
3.3.3. Mariculture.....	26

CHAPTER 4. MANAGEMENT GOAL AND OBJECTIVES 27

CHAPTER 5. GUIDING PRINCIPLES AND MANAGEMENT STRATEGIES 28

5.1. Guiding Principles.....	28
5.1.1. Adoption of Ecosystem-based Approaches to Management	28
5.1.2. Incorporation of the Precautionary Principle	28
5.1.3. Adoption of an Adaptive Management Approach.....	28
5.1.4. Adoption of an Integrated Management Approach for Multiple Uses	29
5.1.5. Collaborative Management through Community Participation	29
5.1.6. Equitable Sharing of Costs and Benefits.....	29
5.1.7. Incorporation of Gender Balance Considerations in Decision-Making.....	29
5.2. Management Strategies	30
5.2.1. <i>Objective:</i> To Conserve Biodiversity, Coelacanth, and Ecosystem Processes	30
5.2.2. <i>Objective:</i> To Promote Sustainable Use of Marine Resources and Rehabilitate the Damaged Resources.....	30
5.2.3. <i>Objective:</i> To Promote Community Participation in Management, Benefit-Sharing and	30
Access to Resources	31
5.2.4. <i>Objective:</i> To Promote Community Education and Information Sharing.....	31
5.2.5. <i>Objective:</i> To Develop Under-Utilized Resources and Emerging Activities Sustainably..	31
5.2.6. <i>Objective:</i> To Facilitate Research and Monitoring of Resources.....	32
5.2.7. <i>Objective:</i> To Promote the Development of Eco-tourism.....	32
5.2.8. <i>Objective:</i> To Conserve and Protect the Cultural Heritage of the TACMP	32

CHAPTER 6. ZONING SCHEME.....	33
RATIONALE.....	33
6.2. Purpose.....	33
6.3. Definition of Zone Types	33
6.3.1. Core Zones	33
6.3.2. Specified Use Zones	34
6.3.3. General Use Zones	35
6.3.4. Buffer Zone.....	36
CHAPTER 7. PROHIBITED AND REGULATED ACTIVITIES	38
7.1. Prohibited Activities	38
7.1.1. Extraction of Living Resources	38
7.1.2. Prohibited Extraction of Non-living Resources.....	39
7.1.3. Prohibited Construction and Development.....	39
7.1.4. Prohibited Tourism Activities	39
7.1.5. Other Prohibited Activities	39
7.2. Regulated Activities	39
7.2.1. Fishing.....	39
7.2.2. Mangrove Harvesting	40
7.2.3. Harvesting of other Forest Products	41
7.2.4. Salt Production	41
7.2.5. Regulated Construction and Development.....	41
7.2.6. Regulated Tourism Activities	41
7.2.7. Scientific Research.....	41
7.3. Summary of Permitted and Regulated Uses	42
CHAPTER 8. MANAGEMENT STRUCTURE AND OPERATIONAL FRAMEWORK.....	45
8.1. Management Structure, Roles and Responsibilities.....	45
8.1.1. The Board of Trustees and the Marine Parks and Reserve Unit	45
8.1.2. The TACMP Advisory Committee	45
8.1.3. The Warden-in-Charge	45
8.1.4. Village Liaison Committees	45
8.1.5. Guiding Role of Village-level Collaborative Management Arrangements and the CMA Plans.....	46
8.1.6. Tanga and Muheza District Councils.....	46
8.2. Subsidiary Regulations	48
CHAPTER 9. MONITORING, EVALUATION AND REVIEW OF THE GMP	49
9.1. Why Monitor Management Effectiveness.....	49
9.2. How to Assess Management Effectiveness for TACMP	49
9.3. Periodic Review of This Plan.....	49
BIBLIOGRAPHY.....	50

ACKNOWLEDGEMENT

Financial assistance for the preparation of this document was provided by ReCoMap with joint funding support from the Government of Tanzania through Marine Parks and Reserves Unit which was the central coordinating agent with the technical support from IUCN. Marine Parks and Reserves Unit staff played a big role in making and ensuring the development of the General Management Plan (GMP).

District Authorities in Muheza and Tanga City provided immeasurable moral and material support throughout the process of developing this GMP.

Indeed, the principal stakeholders including villagers and commercial investors, within Tanga Coelacanth Marine Park (TACMP) are warmly acknowledged for their contributions throughout the course of developing the Plan by their transparency in providing inputs and ideas.

This General Management Plan would not have been possible without the input of experts who assisted in the development of the first draft of the plan including Ms. Kirsten D. Martin, the consultant from IUCN.

PREAMBLE

This document is the General Management Plan for Tanga Coelacanth Marine Park. It is the first general management plan for the park and will serve as the primary management document for the Park during the next ten years.

This document is the result of ideas gathered from stakeholders through consultative meetings, lessons learnt from the previous programmes including Tanga Coastal Zone Conservation and Development Program (TCZCDP), as well as the requirement of Marine Parks and Reserves Act No. 29 of 1994.

The Plan intends to disseminate useful information about the TACMP and its management strategies, activities and products. This information which charts the next 10 years of TACMP will enhance the communication and cooperation which is so vital in protecting important marine resources. In this GMP, Vision and Mission statements of MPRU have been included.

For further information on this General Management Plan or about Tanga Coelacanth Marine Park, contact:

The Manager
Marine Parks & Reserves Unit
P.O. Box 7565, Dar es Salaam
Tel: + 255 (0) 22 2150 621
Fax:+ 255 (0) 22 2150 621
E – Mail: marineparks@marineparks.go.tz
Website: www.marineparks.go.tz

The Warden – in Charge
Tanga Coelacanth Marine Park
P.O. Box 5263, Tanga
Tel: + 255 (0) 22 2150 621
Fax:+ 255 (0) 22 2150 621
E – Mail: marineparks@marineparks.go.tz
Website: www.marineparks.go.tz

APPROVAL PAGE

Implementation of this General Management Plan has been endorsed by the Advisory Committee of the Tanga Coelacanth Marine Park (TACMP), pursuant to sections 5 & 15 of the Marine Parks & Reserves Act No. 29 of 1994, at its meeting of 20th May, 2011.

Mr. Omari Bushiri Omari
Chairman
TACMP Advisory Committee

Mr. Sylvester L. Kazimoto
Warden-in-Charge, TACMP
Secretary TACMP Advisory Committee

Implementation of this General Management Plan has been approved by the Board of Trustees for Marine Parks and Reserves, pursuant to sections 4 & 15 of the Marine Parks & Reserves Act No. 29 of 1994, at its thirtieth (30th) Ordinary Board Meeting held on 5th July, 2011.

Dr. Blandina Lugendo
Chairman
Board of Trustees

Dr. Abdillahi Chande
Unit Manager, MPRU
Secretary, Board of Trustees

This General Management Plan has been adopted by the Minister for Livestock and Fisheries Development pursuant to section 14 of the Marine Parks & Reserves Act No. 29 of 1994.

Hon. Dr. David Mathayo David (MP)
Minister for Livestock and Fisheries Development
United Republic of Tanzania

VISION

“Marine Protected Areas in Tanzania become the joy and pride for all”.

MISSION

“To establish and manage Tanzania’s Marine Protected Areas for sustainable use”

MOTTO

“Let us share the gift of nature together”

ACRONYMS

AC	Advisory Committee
ACEP	African Coelacanth Eco-system Programme
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CMAPs	Collaborative Management Area Plans
DAQ	Division of Aquaculture
DoFD	Division of Fisheries Development
DRTE	Division of Research, Training and Extension
EIS	Environmental Impact Statement
GIS	Geographical Information System
GMP	General Management Plan
ICM	Integrated Coastal Management
IUCN	International Union for the Conservation of Nature
MCS	Monitoring, Control and Surveillance
MLFD	Ministry of Livestock and Fisheries Development
MPRU	Marine Parks and Reserves Unit
NGO	Non-governmental Organization
ReCoMap	Regional Coastal Management Programme of the Indian Ocean Countries
TACMP	Tanga Coelacanth Marine Park
URT	United Republic of Tanzania
VEUs	Village Enforcement Units
VLCs	Village Liaison Committees
WIC	Warden-in-Charge
TCZCDP	Tanga Coastal Zone Conservation and Development Programme
TCRC	Tanga Coastal Resource Center

FOREWORD

Tanzania's coastal strip has historically been a centre of wealth creation, through trade, extraction of natural resources, and most recently from tourism and mariculture. Through the centuries, this wealth has attracted people to Tanzania's coastal areas, both from within the country and beyond its borders, and, therefore, creating a rich and varied cultural heritage. Alongside this human realm, Tanzania's marine and coastal areas are also rich in biological diversity, harbouring a wealth of species of fish, marine invertebrates, marine mammals, reptiles, birds and plant life. As such, they have increasingly come to the attention of those concerned with the conservation of our country's natural heritage, in terms of its wildlife, biodiversity and scenic splendor.

The present population along Tanzania's 1,400 km coastline is approaching 10 million people. Outside of the trading hubs of Dar es Salaam, Zanzibar, Tanga and Mtwara, the livelihoods of many coastal people has increasingly come to depend upon small scale fisheries, mangroves and non-living resources including to provide all the essentials of life. Increasingly, these marine and coastal natural resources, and by extension the associated biodiversity, have come under severe threats from over-use, unplanned commercial development and destructive practices.

In this context, the Government of Tanzania has dual obligations; both to safeguard the livelihoods of coastal people and future generations, and also to ensure the continued survival of the rich variety of living organisms bequeathed by nature.

To respond to this challenge the Tanzanian government established the Board of Trustees for Marine Parks and Reserves in 1996, to oversee a system of marine protected areas wherein special management effort can be focused. Whereas the marine reserves will provide total protection from extractive resource-use to small areas, the marine parks aim to achieve the sustainable accommodation of livelihood, environmental and commercial interests. The key to success of this ambitious undertaking will be an active and equal partnership between government, communities and investors. As such, we must be confident constantly to evaluate our performance, take on board constructive suggestions and to welcome contributions from outside.

Tanga Coelacanth Marine Park (TACMP) is the third marine park to be gazetted under this national initiative. I have every reason to say that TACMP will manage to live to the expectation of the nation. Not only that the ecosystem will be improved tremendously but also sustainable livelihood among key stakeholders will be improved.

This Plan is the main instrument that specifies how management of the resources is to be conducted in the next ten years. It is an instrument not just for planning but also for operational management. Indeed, it has documented the way to reach management goals in the future and describe how to manage the resources within the park. The document contains a description of the resources especially its current status, management objectives and more importantly how these objectives are to be achieved. Another important feature of this GMP is that it outlines how the plan will be reviewed and the consultative process which will be followed.

Hence, the great challenge ahead is for TACMP to put this GMP into practical effect so that the Park would continue to play a leading role in the collaborative management of Marine Protected Areas in Tanzania and beyond the borders. Indeed, it is my pleasure to take this opportunity to extend all possible good wishes to managers and stakeholders in fulfilling our mission towards meeting the marine conservation and sustainable livelihood challenges.

Hon. Dr. David Mathayo David (MP)
Minister for Livestock and Fisheries Development
United Republic of Tanzania

EXECUTIVE SUMMARY

The development of General Management Plan (GMP) for The Tanga Coelacanth Marine Park (TACMP) fulfils the legal requirement stipulated in the Marine Parks and Reserves Act No. 29 of 1994 for each Marine Park to have a guiding plan for its management. The park was gazetted through the Government Notice No. 307 of 28th August, 2009.

Tanga Coelacanth Marine Park is located on the northern coastline of Tanzania. It extends from north of Pangani River estuary 100 km along the coastline towards Mafuriko village just north of Tanga City. The Park covers an area of about 552 km² of which 85 km² are terrestrial and 467 km² are marine. It encompasses 9 villages and 9 Tanga City localities (Mitaa) with a population of about 45,000 residents. The Park is located between 5° 03' 37" S 39° 14' 41" E and 5° 24' 13" S 39° 08' 12" E and 5° 21' 39" S 39° 01' 55" E and 5° 03' 21" S 39° 03' 21" E. It includes the bays of Tanga City and Mwambani, Tongoni estuary, and three small islands of Toten, Yambe and Karange. The uniqueness of the park includes: the occurrence and high rates of incidental catches of the CITES - listed and iconic Coelacanth, *Latimeria chalumnae*. Moreover, the area has a highly productive and diverse fisheries resources and coral reef communities. The latter is known to have high levels of resilience against the impacts from climate change.

This Management Plan is considered to be a long-term roadmap for conservation of marine and coastal biodiversity, and the Plan also provides the basis for partnership among stakeholders.

The main coastal livelihood is fishing, with up to 80% of the adult males in coastal villages involved in artisanal fishing of finfish, prawns, octopus, or sea cucumbers. Generally, there is a high reliance on marine and coastal resources, with increasing demands resulting from population growth and decrease in resource availability.

The park is faced by several management issues which include human practices including destructive fishing practices through use of dynamites and beach seines among other practices, excessive and unregulated fishing pressure and unsustainable mangrove harvests. Socio-economic issues include inaccessible markets and financial capital.

For the purpose of achieving the main goal of conserving national and internationally significant marine biodiversity and ecosystem functions of the TACMP, eight management objectives have been developed. These objectives include:

- To protect, conserve and restore the species and genetic diversity of living and non-living marine resources while considering the threatened coelacanth and its habitat, and safeguard the ecosystem processes of the marine and coastal area;
- To manage the marine and coastal area so as to promote sustainability of existing resource use; the recovery of areas and resources that have been over-exploited or otherwise damaged and to rehabilitate damaged ecosystems;
- To ensure that villagers and other park residents are involved in all phases of planning, development and management of the marine park, and have priority in the resource use and economic opportunities;
- To promote the rational development and sustainable use of under-utilized natural resources and emerging activities;
- To promote community-oriented education and dissemination of information concerning conservation and sustainable use of resources;
- To facilitate research and monitoring of resource conditions and uses within the marine park.

In addition, stakeholders' consultative workshops participants added two more objectives for TACMP:

- To facilitate and promote the development of appropriate eco-tourism;
- To conserve and protect the cultural heritage of the park residents.

The identification of these objectives and the management issues form the basis for the GMP management strategies including the zoning plan. The broad aim of the management actions and strategies is to fulfill these objectives in a manner that does not create conflict between user groups, or compromise the conservation goal of the park.

The zoning plan divides all areas within the park boundary into 3 types of use-zones namely *Core zone*, *Specified-use zone* and *Regulated-use zone*. The types of zones have different regimes of protection and permitted activities depending on the respective importance to conservation and economic activity of the areas designated under each.

Alongside the zoning plan, the marine park will continue to implement a series of community-based programmes to assist the development of supplementary income generating activities, including under-utilised resources and tourism and to disseminate appropriate technologies for improved sustainable livelihood.

The Management Plan does also highlight regulatory measures by pointing out prohibited and regulated activities in each use zone within TACMP. In addition, a management framework has been sighted in which the relation with various bodies and local authorities is being transparently shown. Stipulated in the Plan are guidelines for monitoring and evaluation of the activities of the Park.



CHAPTER 1

INTRODUCTION

This chapter briefly introduces the purpose of this management plan, its intended audience and a short history of the development of the Tanga Coelacanth Marine Park.

1.1. WHY A GENERAL MANAGEMENT PLAN

Tanga Coelacanth Marine Park is located on the northern coastline of Tanzania. It extends from north of Pangani River estuary 100 km along the coastline towards Mafuriko village just north of Tanga City. The Park covers an area of about 552 km² of which 85 km² are terrestrial and 467 km² are marine. It encompasses 9 villages and 9 Tanga City localities (Mitaa) with a population of about 45,000 residents. The Park is located between 5° 03' 37''S 39° 14' 41''E and 5° 24' 13''S 39° 08' 12''E and 5° 21' 39''S 39° 01' 55''E and 5° 03' 21''S 39° 03' 21''E. It includes the bays of Tanga City and Mwambani, Tongoni estuary, and three small islands of Toten, Yambe and Karange (Fig. 1).

TACMP was gazetted in 2009 by the Government of Tanzania as a marine park under the Marine Parks and Reserves Act No. 29 of 1994, and it is the third marine park in Tanzania mainland.

The area has been designated as a Marine Park due to the following reasons,

- the presence of the CITES-listed and iconic coelacanth, *Latimeria chalumnae*
- highly productive and diverse fisheries resources on which an overwhelming percentage of local park residents depend,
- a representative coverage of coastal and marine habitats which harbor high biodiversity found along the Eastern African coastline
- diverse coral reef communities with high levels of resilience against the impacts from climate change
- significant potential for coastal tourism.
- Additionally, WWF has identified Tanga coastal region as an eco-regionally important seascape within its Tanga-Msambweni East African Marine Eco-region, attributing it to high rates of coral genera and a wider coral reef complex shared with neighboring Kenya; important turtle, dugong and water bird feeding areas, as well as extensive mangrove ecosystems.

The Plan is the main tool to guide the development and operational management of a marine park, and a key requirement as per Section 14 of the Marine Parks and Reserves Act No. 29 of 1994. It clearly defines the objectives, management strategies and regulatory framework for conservation and sustainable resource use within the TACMP. In addition, it aims at striking a balance between protecting natural and cultural values, optimizing economic uses to further sustainable development, and integrating traditional uses.

This GMP also provides the basis for making joint and informed decisions with all stakeholders on how to effectively manage the natural resources in and around the marine park. TACMP thereby builds upon the earlier initiatives of collaborative management of coastal resources in Tanga region through the Tanga Coastal Zone Conservation and Development Programme.

1.2. TARGET AUDIENCE OF THE GENERAL MANAGEMENT PLAN

This GMP is intended to be accessible to all interested parties in a transparent manner and its successful implementation will be ensured through active involvement of all stakeholders and interest groups, including:

- Local communities within and adjacent to the marine park
- TACMP staff
- Other Marine Parks and Reserves Unit (MPRU) staff
- Local and Central Government staff and public institutions representatives involved in the broader field of natural resources management and economic development, including, but not limited to, staff from the Fisheries and Forestry Departments, National Environment Management Council, Tanzania Port Authority, Tanzania Coastal Management Partnership

- Investors who may have an interest in economic activities in TACMP and in the buffer zone adjacent to the Park (e.g. fisheries, mariculture, seafood processing, tourism developers, micro-credits & loans, sisal estates and mining)
- Police, Navy and other enforcement & surveillance entities
- Judiciary institutions at District and national level
- Researchers, scientists and other technical experts working in related fields (e.g. from NGOs)
- Managers involved in Marine Protected Areas in East Africa and around the world including IUCN and WWF.

1.3. HISTORICAL DEVELOPMENT OF TANGA COELACANTH MARINE PARK

The history of integrated coastal area management in the Tanga region started with project assistance by the Tanga Coastal Zone Conservation and Development Programme (TCZCDP, 1994 - 2004), whose activities are still being coordinated through the Tanga Coastal Resource Centre (TCRC). Some fishing communities and other local resource users have played a pivotal role in safeguarding the integrity of the coastal area of today's TACMP (Wells *et al.* 2007).

The history of Coelacanths in Tanzania started in September 2003, when a single fish was caught off the coast of Songo Mnara near Kilwa by deep-set gill nets. By October 2010, more than 37 captures of Coelacanths, using deep-set shark gill nets, have been reported in the fishing villages of Kigombe, Mwarongo and Mwambani within today's Park area. The unprecedented catches of Coelacanths have called for urgent management measures to protect the endangered species and other resources in Tanzania, and this triggered the gazettment of the area as a marine park by the Tanzanian Government in 2009. Today the park seeks to address unsustainable resource use issues and practices, featuring Coelacanth protection prominently as a key component for achieving its species and biodiversity conservation objective.

Three local and international stakeholders' workshops were held by the MPRU in 2007 and 2008 with support from the African Coelacanth Ecosystem Programme (ACEP) and Marine and Coastal Environmental Management Programme (MACEMP). These raised awareness of the coelacanth by-catch problem by planning a scientific research cruise to survey the biophysical and oceanographic conditions of the species' ecology and abundance in Tanga (ACEP cruise report 2007/8). Conservation planning for coelacanths and other critical habitats in the area was initiated by stakeholders and concluded with participants' call for the establishment of a conservation area to protect the species and its environment.

Research findings confirmed that Tanga coastal area supports a complex and diverse system of coral reefs, mangroves, sea grass beds and critical coelacanth habitat (Wells *et al.* 2007; Kaehler *et al.* 2007/8; Muhando, 2009). Socio-economic surveys moreover found that the communities living in Tanga region, amounting to some 566,000 people in 49 villages, are heavily dependent on coastal and marine resources in order to sustain their livelihoods (Gorman, 1995; Harrison, 2010). This situation resulted in intensive pressure on the natural resources, particularly as caused by destructive resource use practice. The assessments concluded that a marine park in Tanga region would provide a significant opportunity to address the concerns over resource status decline, by-catch of the coelacanths, and a resurgence particularly of dynamite fishing. A marine park moreover provides the outstanding opportunity to formally link aspects of socio-economic development, sustainable resource management and conservation through close involvement of the local communities, as firmly enshrined in the MPRs Act No. 29 of 1994 and similar sectoral policies at central and local government levels.

The Government of Tanzania considered the area as a priority for conservation and designated it as Tanga Coelacanth Marine Park (TACMP) under the Marine Parks and Reserves Act No. 29 of 1994 on 28th August, 2009 through Government Notice No. 307. This significant commitment seeks to build on the adaptive co-management approach implemented under MPRs Act and other fisheries related legislations.

The development and participatory planning for the establishment of a marine protected area in Tanga has since then been actively promoted by MPRU, with technical assistance from IUCN and financial assistance from the Regional Programme for the Sustainable Management of the Coastal Zones of the Countries of the Indian Ocean (ReCoMap). The development of the General Management Plan (GMP) for TACMP, through participatory consultations with the park's numerous stakeholders, started in September 2010 and is an integral part of these efforts.

1.4 SIGNIFICANCE OF TACMP

The TACMP is unique nationally and internationally for the presence and high abundance of the coelacanth, *Latimeria chalumnae*. The rare 'living fossil' fish was re-discovered in the coastal waters off Tanzania in 2003, and since then has been sighted frequently within the TACMP area. Today, many of the park's residents see the coelacanth as an icon for their rich coastal resources and opportunities for eco-tourism. Furthermore, TACMP is home to other endangered species like dugong, which was sighted in 2006 off Kigombe, sea turtles and migratory water birds.

The marine park includes within its boundaries a total of 9 villages and 9 localities within the city (Mitaa) with an approximated population of 45,000 residents, excluding the buffer zone. There is no other marine park in Tanzania that hosts a similar number and density of people within its boundaries as they are located in remote areas. This amplifies the critical need for a participatory, balanced and considerate resource management and conservation strategy, which must be based on multiple uses.

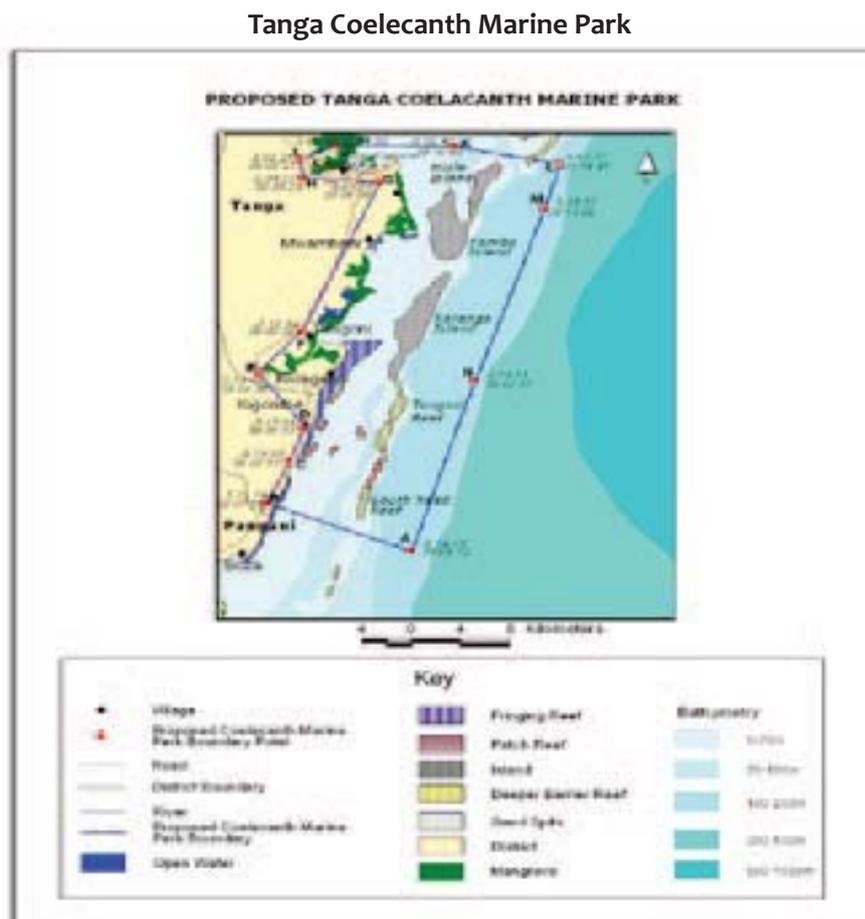


Figure. 1. The coastal map of Tanga showing the location and important features of TACMP

CHAPTER 2

RESOURCE DESCRIPTION AND USE

The waters around Tanga Coelacanth Marine Park host an outstanding representative of tropical marine habitats including coral reefs, sea grass beds, mangroves, and inter-tidal flats. The area has been recognized internationally as a critical site for biodiversity including living fossil fish (Coelacanth). The productive fisheries and other marine resources provide food and income for the local community.

2.1. AREA AND LOCATION

Tanga Region is situated in northern Tanzania and the coastal area covers 1,600km² including Districts of Pangani, Muheza, Tanga City and Mkinga (Fig. 2). The region is warm and humid, with fertile soils and significant stands of coastal tropical forests (Horril *et al.* 2000). The coast encompasses numerous islands, deep channels and drop-offs, estuaries and bays. It is characterized by 96 fringing and patch coral reefs, 7 medium sized mangrove forests, and numerous seagrass beds (Horril *et al.* 2000). The largest river in Tanga Region is Pangani, which flows south-east through the Usambara mountains and enters the Indian Ocean at Pangani Town south of the park.

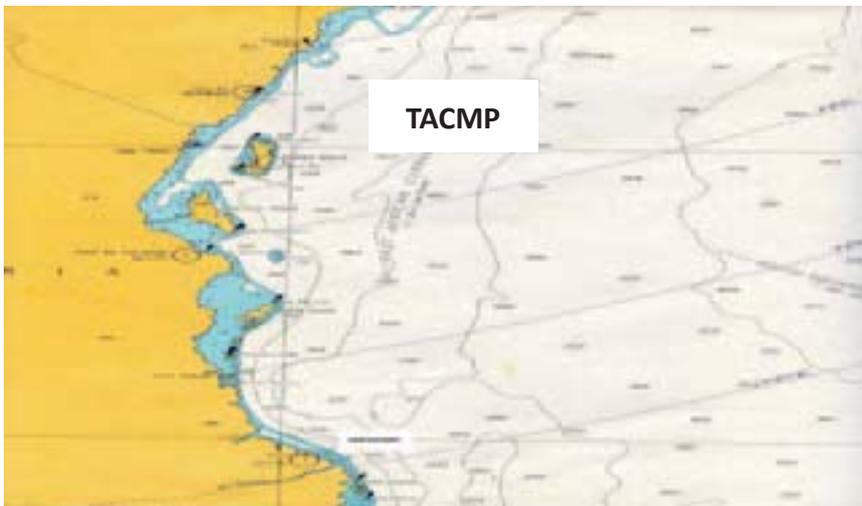


Fig.2: The northern coastal map of Tanzania showing the location of Tanga Coelacanth Marine Park

Tanga Coelacanth Marine Park is located on the northern coastline of Tanzania. It extends from north of Pangani River estuary 100 km along the coastline towards Mafuriko village just north of Tanga City. The Park spans across the two Districts of Muheza and Tanga City covering an area of about 552 km² of which 85 km² are terrestrial and 467 km² are marine. It encompasses 9 villages and 9 Tanga City localities (Mitaa) with a population of about 45,000 residents. The Park is located between 5° 03' 37" S 39° 14' 41" E and 5° 24' 13" S 39° 08' 12" E and 5° 21' 39" S 39° 01' 55" E and 5° 03' 21" S 39° 03' 21" E. It includes the bays of Tanga City and Mwambani, Tongoni estuary, and three small islands of Toten, Yambe and Karange.

The park area supports a number of ecologically important and diverse habitats. Inshore waters are characterized by fringing and patch coral reefs, sea grass beds, mangrove forests, and several estuaries and bays. Major geographical features found within the northern part are Toten Island, the islands of Yambe Karange, and Mwambani Bay. The islands are covered by stands of coastal forest, with steep submerged slopes leading eastwards into the Pemba Channel.

2. 2 PHYSICAL FEATURES

2.2.1. Geology and Topography

Tanga Region covers an area which rises from the sea to approximately 600 m above sea level. The coastal plains extend inwards from the shore for 20-30 km with a variety of grasslands, sisal plantations and trees. They are bordered by the Usambara Mountains to the northwest, where most of the high elevation points are found.

The coastal plains are composed of both marine and terrestrial sediments. Much of the coast is of Pleistocene and more recent coral limestone. The soil types include dark clays on older alluvial deposits of volcanic origin, and grey bottomland soils. A belt inland from the coast contains continental and coastal deposits of limestone, sands and gravel. The marine rocks consist of marls, limestone and shells (UNESCO-IOC, 2009). The presence of higher level of iron and manganese in groundwater along the Tanga coastline often results in turbid and colored water supplies in some areas (UNEP, 2001).

2.2.2. Bathymetry

The continental shelf off Tanga Region is about 2,090 km² in area and comparatively narrow. It varies in width from 5-10 km between Tanga and Pangani to over 40 km near the Kenya border (Bensted-Smith, 1988). The 200 m depth contour is approximately 4 km offshore (UNESCO-IOC, 2009) (Fig. 3).

The shallow waters of the continental shelf are characterized by a series of 96 submerged fringing and patch reefs, mangrove habitats, seagrass beds and sand banks, and the deeper shelf areas are characterized by many small ridge-like extrusions that form caves in which Coelacanths have been found (Kaehler *et al.* 2007/8). Main elevations within TACMP are the outer coral rag islands of Toten Island, Yambe, and Karange, where most of the Coelacanths have been found. A small sea-floor feature of approximately 80m height has been discovered to the east of Fungu Tongoni reef not earlier than 2007 (Kaehler *et al.* 2007/8). At approximately 80m depth, the shelf scarp increases rapidly to about 150m depth, and from there the seafloor tends to be flat and smooth.

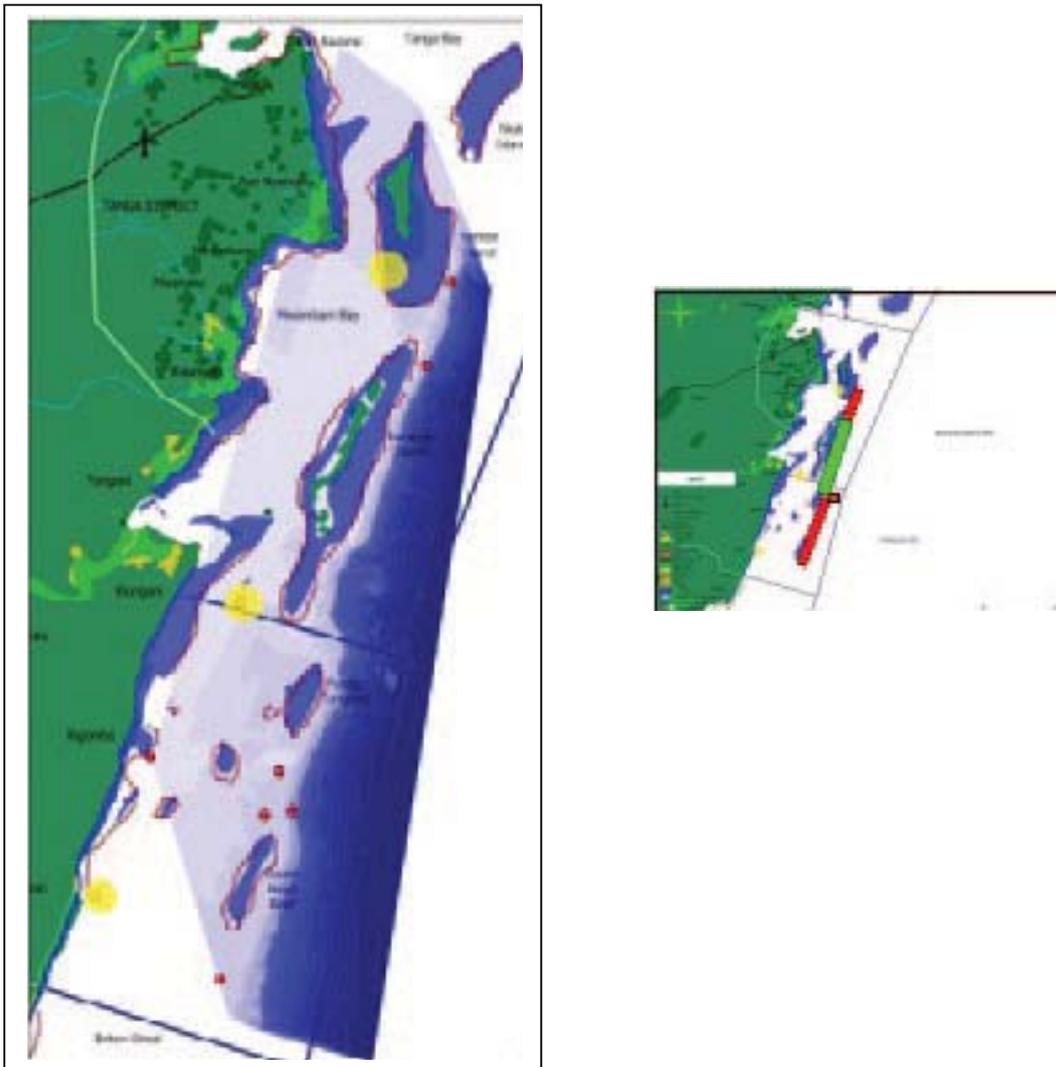


Figure 3. The area of most frequent *Coelacanth* catches that has been mapped to the 300m depth contour (right) and bathymetric chart of the area at contour intervals of 50m depth (left). Red dots: *Coelacanth* captures sites. Source: Kaehler et al. 2007/8

2.3. CLIMATE

The climate of the northern coast of Tanzania is tropical with warm and humid conditions. The humidity ranges between 60-80% (UNESCO-IOC, 2009). It is influenced by the seasonally changing monsoon winds of the Indian Ocean, creating two main seasons: the Northeast Monsoon (*Kaskazi*, November to February) with higher air temperatures and lower wind speeds, and the Southeast Monsoon (*Kusi*, April to September) with typically cooler air temperatures, higher wind speeds and rough seas. Between the changing monsoons there is usually a calmer period (*Matlai*), March / April and October / November).

2.3.1. Weather Conditions

The North-East Monsoon is normally associated with air temperatures of 28-32°C and high surface water temperatures of up to 31°C, with few showers and moderate to strong winds. Beyond June, into the Southern Monsoon, the climate is cooler and drier (approx. 23°C), but consistently has the strongest winds until approximately November.

The rainfall pattern is bimodal with amounts ranging between 800 and 1600 mm/year on average (differs from one district and year to the other). January and February are generally dry. From March to May the coast experiences long comparatively heavier rains, and short rains between November and December (UNESCO-IOC, 2009).

The coral bleaching event (March to May 1998) coincided with increased rainfall and lower ocean salinity, due to higher than normal seawater temperatures (Muhando, 1999).

2.3.2. El Niño - Southern Oscillation (ENSO)

In 1998 a major El Niño took place which increased sea surface temperatures and severely affected the Indian Ocean ecosystems, particularly coral reefs. In Tanga, this resulted in about 50% loss in coral cover on all reefs inside the present marine park (decrease from 67% to 12.5% coral cover between 1997 and 1999). Gradual recovery from this bleaching event was however seen again from 2000.

2.4. OCEANOGRAPHY

2.4.1. Currents

The major currents prevailing in the coastal waters of Tanzania, including TACMP, are the South Equatorial Current (SEC) flowing westwards around 12°S (approximate border area of Tanzania and Mozambique), and the East Africa Coastal Current (EACC) flowing northwards from there along the coast. The EACC is a steady current, strongest during the Southern Monsoon (April - October) when surface currents can exceed 3 m/s, and weaker during the Northern Monsoon (November-March) with an average speed of 0.5 m/s (UNESCO-IOC, 2009). Depending on the strength of the north-east monsoon, the northward flowing EACC can change direction to flow eastward and offshore as equatorial counter current (ECC) at any particular time of the year.

For TACMP, speeds of over 1 m/sec were recorded in TACMP waters in October 2007. Island wake upwelling with enhanced chlorophyll production seems to prevail in the northern reaches around Pemba Island. Investigation of several eddies and upwelling cells for primary production, phytoplankton, zooplankton, trophic links and nutrient sources had been undertaken with results forthcoming. Generally, chlorophyll productivity is comparatively low in Tanzanian waters with 0.4 -1.4 mg/m³ where no upwelling is served. Salinity values are generally lower during May due to freshwater outflow, and highest in November (UNEP, 2001).

2.4.2. Tides

Tides are semi-diurnal with high and low waters occurring twice within a day. Mean spring tide for Tanzania is about 3.5 m and mean neap tide about 2.5 m (UNESCO-IOC, 2009). For Tanga, a maximum diurnal range of about 4.5 m has been recorded. During the low water - spring tides, biggest changes are seen over the area of Mwambani Bay where an extensive area of sand and sea grass gets exposed. Seawater visibility is clear most of the times. Tides not only influence ecological processes in the coastal waters and likely the distribution pattern of coelacanths, but also largely determine resource use activities by coastal communities, such as skin diving for octopus and spiny lobsters during neap tides, use of scoop nets from shore, etc. Scientists recommend the installation of a permanent tide gauge in the park.

2.4.3. Surface Water Temperature

The sea surface temperatures are seasonal in the coastal waters, varying between 25°C in July-September and 28-29°C in shallow areas during north-east monsoon in January - March. The depth of the upper mixed layer varies from 20m (March and November) to 100m (June - July), due to the seasonal variations of wind speed and direction (UNEP, 2001) (Fig. 4).

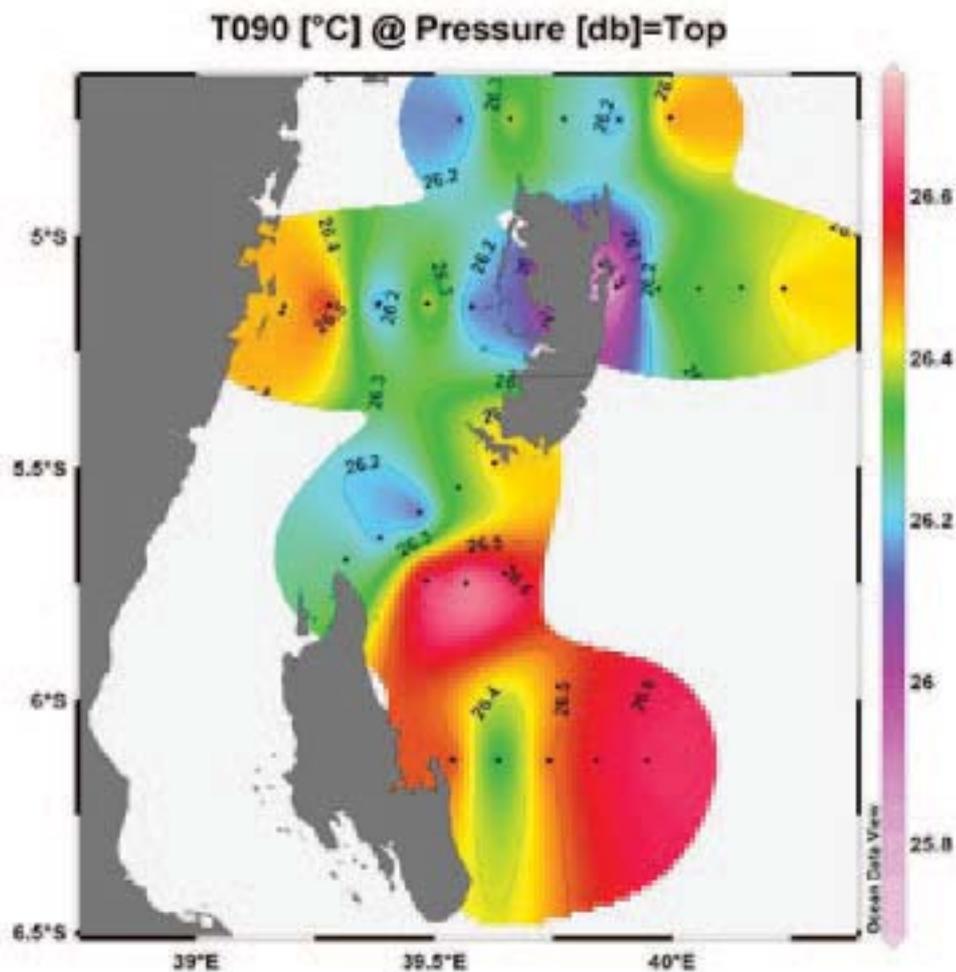


Figure 4. Surface temperature plot showing warm water temperature for Tanga Region, colder waters in the Pemba Channel and cold upwelling around Pemba Island. Source: Kaehler et al. 2007/8.

In TACMP near-shore areas, warm water of $>25^{\circ}\text{C}$ sometimes penetrated depths of more than 200m, whereas at other times temperatures of $<20^{\circ}\text{C}$ were found at only 120m depth. As coelacanths seem to be intolerant of water above 23°C (Ribbink & Roberts, 2006), movements of cool or warm water into the area may presumably affect coelacanth distribution and this has direct implications for TACMP management.

2.5. THE NATURAL ENVIRONMENT

A summary of the status of marine and coastal biodiversity, its distribution and general condition is presented in the following sections:

2.5.1. Mangrove Forests

Tanga region has Tanzania's third largest mangrove forest cover approx. 13,192 ha (MMP, 2000), after Rufiji and Kilwa. From 1998-2003, 176.4 ha of mangrove area were replanted (Wells et al. 2007). Natural mangrove cover is said to have been largely maintained in Muheza District and that large areas have been replanted (a total of over 200 ha, with 400,000 seedlings). In TACMP, mangroves are predominant in river estuaries as well as on Yambe and Karange. A large area of mangrove forest is spanning the villages of Mtambwe, Ndumi, Mwambani Mchukuuni, Jambe Island and Geza; Mwarongo, Tongoni and a small strip south of Kigombe.

Nine species of mangroves exist inside the park area: *Avicennia marina*, *Bruguiera gymnorhiza*, *Ceriops tagal*, *Heritiera littoralis*, *Lumnitzera racemosa*, *Rhizophora mucronata*, *Sonneratia alba*, *Xylocarpus granatum* and *Xylocarpus molluccensis*.



Mangrove Forest in TACMP

Regular mangrove monitoring is carried out in Chongoleani mangrove forest (551ha) in Tanga Municipality since 2003. The national Mangrove Management Project implements the Mangrove Management Plan (MMP, 1991) at a nationwide scale, which also encourages participatory monitoring with coastal villagers and includes regular replanting activities (Wells *et al.* 2007).

Mangrove habitats have many ecological functions and economic potential. They contribute significantly to fisheries productivity by providing feeding, breeding and nursery grounds for fisheries of shellfish and finfish. Mangroves are also habitat for honeybees (beekeeping), for mammal and bird species (eco-tourism activities). They have an important role in preventing erosion and stabilizing mud banks in estuarine systems, in building land through accumulation of silt and detritus, and providing renewable coastal protection against storms.

2.5.2. Muddy Shores / Mud Flats

Mud flats occur in shallow calm water bays from Kilanje Creek at Mtang'ate Bay northwards to the Kenya border (UNEP, 2001), and in Tongoni. These ecosystems support a variety of aquatic fauna and avifauna including seabirds, mangrove kingfisher, coastal waders and pelicans.

2.5.3. Seagrass Beds

There are numerous and extensive seagrass beds within the park area, but their extent and ecological patterns inside the marine park are not well documented to-date (Kaehler *et al.* 2007).

Seagrass beds are considered highly vulnerable to human activities, such as prawn trawling, seine and drag nets. The habitat is particularly critical as a nursery ground for juvenile fish of the majority of fish species exploited in TACMP, as major contributor to coastal productivity, and as feeding habitat for endangered species like dugong and green turtle.

2.5.4. Rocky Shores and Macro-algae / Seaweeds

Rocky shores in TACMP mainly consist of marine fossils dating at least 15,000 years back, when ancient coral reefs were exposed during the last ice age. The forms of rocky shores include the outer coral rag islands of Toten Island, Yambe and Karange. Mwambani Bay is fringed with limestone cliffs.

Over 340 species of red, green and brown intertidal Macro-algae (referred to as seaweeds or 'mwani' in Kiswahili) are recorded to occur in Tanzania (Oliveira *et al.* 2005). On the TACMP coastal rocky shore, 105 macroalgal species have been initially identified. TACMP species were to 43% red algae of small size and substrate cover; 26.6% of green algae dominating the upper and middle intertidal; 29% brown algae of greater biomass (supporting the highest productivity), greater substrate cover and dominant in lower intertidal areas (Buriyo *et al.*, 2009). Intertidal rocky shores in TACMP are richer in macroalgal species, particularly in Kibaoni, Dahali, followed by Kigombe, than coral reefs and muddy substrates. Most abundant genera are (red) *Hypnea*, *Gracilaria*, *Jania* and *Amphiroa*; (brown) *Dictyota*, *Padina*, *Sargassum*, *Turbinaria*; and (green) *Caulerpa*, *Chaetomorpha*, *Halimeda* and *Ulva* (Buriyo *et al.*, 2009).



Seaweed harvesting in TACMP

2.5.5. Coral Reefs

Of the 407 km of coastline in the Tanga region, 97 km are bordered by distinct sections of fringing reefs and there are at least 55 outer and inner patch reefs recognized in the area, yielding a total of 376 km of reef edge in the region (Horrill *et al.* 2000). Fringing reefs occur along the coast, shallow patch reefs are found in the inshore waters, and offshore there are deeper reefs near the drop-offs.

The reefs in the Tanga region are generally rich in marine biodiversity, and support a large local fishing community (McClanahan *et al.* 1999). In 1968, Tanga reefs were perceived as ranking among the 'best' along the Tanzanian coastline (Ray, 1968). A total of 47 coral genera have been recorded with diversity increasing from 20 genera on the inshore fringing reefs, to 24 on the inner patch reefs and 28 on the outer patch reefs (Horrill *et al.* 2000). Reef communities vary both from north to south and from inshore to offshore (Othina and Samoily, 2005).

Those in the north are more extensive with sandy areas, whereas those in the south are smaller and more precisely defined with generally higher coral cover (Wells *et al.* 2005). Seagrass-dominated areas tend to be more prevalent on the leeward side of the reefs. However, clear distinction between coral reefs, seagrass and seaweed-dominated areas is sometimes difficult, such as in the case of Kange, Fungu Tongoni, Taa and Makome (Kaehler *et al.* 2007). The differences in geomorphology and reef structure are also reflected in the fish community structure, which is significantly different on the more southern reefs than on those to the north, and some of the offshore reefs compared to reefs closer to shore (Othina and Samoily, 2005).



Coral reef in TACMP

Coral cover and structural reef damage has a long history in Tanga. In 1987 reefs were reported as being in poor condition with an average 10-20% of live coral cover (Bensted-Smith, 1988). In 1995, 12% were estimated to be completely destroyed, 64% in poor or moderate condition, and 24% in good condition. Abundance of commercially important fish families, such as snappers, emperors, and rabbitfish, was low on 90% of the reefs, as were populations of commercially important lobster, sea cucumbers, and molluscs (Horrill *et al.* 2000). Corals declined further from bleaching effects of El Niño in 1998 (by 50% on all reefs in Tanga) and coral disease in 2003. In 2006, highest coral cover was 40-50% on closed and inner reefs, largely due to successful management measures by the Tanga Coastal Zone Management and Conservation Project (TCZCDP). In 2007, it was confirmed that habitats have degraded quickly due to resurfaced dynamite fishing and that biodiversity, community structure and species richness were all negatively affected with signs of succession with secondary colonizers like microphytes and algae (Kaehler *et al.* 2007/8).

Most of the decline in reef health has been attributed to structural damage from dynamite fishing, particularly to the south of TACMP (off Kigombe) and in close vicinity to Tanga City. Weighted nets, boat anchors and hulls flattening the top of shallow reefs, and trampling of those reefs exposed at spring low tides may play an additional role, and the large increase in fishers may play a role in the comparatively low fish abundances on reefs (Wells *et al.* 2005).

2.5.6. Phytoplankton

Phytoplankton communities around Pemba Channel are dominated by small flagellates. Diatoms were more important at greater depth, whereas prokaryotes were significant in surface waters to 25m (Kaehler *et al.* 2007/8). Generally, phytoplankton and chlorophyll-a concentration data are still scarce for Tanzania.

2.5.7. Fish Community Structure and Populations

Some 380 fish species have been identified for Tanga waters (Spalding *et al.* 2001, Mhithu, 2007), mostly from landed catches and observations during underwater surveys. The most important families in reef fish catches are Lethrinidae, Lutjanidae, Siganidae, Scaridae, Labridae and Mullidae. There are large-scale ecological and fish community differences between reef areas to the south of the park and those inside TACMP, whereas fish community structure on reefs previously closed tends to be similar. Reef cluster according to similarity in fish communities (the closer the reefs are connected the more similar the reef fish community) (Othina and Samoily, 2005).



Fish found in TACMP

Fish community structure on reefs near Tanga appeared significantly altered due to overexploitation and destructive fishing (Kaehler *et al.* 2007/8, Horrill *et al.* 2000). 53% of the species were from major reef fish families, however there was a noticeable lack of predatory reef fishes and on average the fish were too small (75% under 40cm, most around 20cm), being clear signs of overexploitation. Triggerfish, which are important sea urchin predators and contributed to reef health, were scarce on the reefs inside the area presently designated as a park, and damaged reefs in the northern part had high sea urchin densities. Demersal and large pelagic fish had notable low catch rates, which also indicates overexploitation (Horrill *et al.* 2001). Regular monitoring between 1995 and 2008 confirmed the low fish abundance and biomass in commercially exploited species, particularly groupers, snappers, emperors, grunts and rabbit fish.

Despite a gradually increasing trend 1998-2001 in population densities of these species especially on closed reefs, fish abundance was largely declining since 2003 (Wells *et al.* 2007). Snappers, emperors, grunts and rabbitfish were the most important fisheries target groups. The biomass of this group was considered very low (at about 8kg/ha) compared to an average biomass of 250 to 300kg/ha on closed reefs (McClanahan *et al.* 2005).

2.5.8. The Coelacanth, *Latimeria chalumnae*

One of the most notable fish in the region is the Coelacanth, *Latimeria chalumnae*. Often referred to as a 'living fossil fish', its conservation status is that of endangered, CITES - Annex 1 species. Within the park area, Coelacanths seem to mainly occur along the outer island drop-offs.

The northern coast of Tanzania has been at the centre of national and international attention since 2003 when Coelacanths were rediscovered in the area. One fish was caught off the coast of Songo Mnara near Kilwa by deep-set gill net in September 2003. In 2004, fishers from Kigombe caught 4 specimens when using deep-set shark nets set on the inshore seabed between 50-200m depth. In a period of 3 months, 15 coelacanths were caught off the coast of Kigombe.



Coelacanth specimen

As of January 2011, at least 37 specimens were captured as by-catch in the Park, mainly in the fishing villages of Kigombe, Mwarongo and Mwambani. The major reason for the sudden appearance of coelacanths in catches is that shark nets had been set in deeper waters over the last 10 years, due to diminishing fisheries catches in the inshore waters.

The unprecedented catch incidents of coelacanths in Tanga area called for urgent management measures to protect the species in Tanzania, to sustain representative reef and deepwater ecosystems and ensure maintenance of the ecosystem processes on which coastal communities as well as coelacanths depend.

2.5.9. Invertebrates

Octopus

Densities of octopus are comparatively low with about 0.05 individuals/50m², possibly due to severe overfishing or inadequate sampling during TCZCDP regular monitoring (Wells et al. 2007). Octopus species grow extremely fast, increasing in weight by up to 200g in 10 days, and can potentially support a highly productive fishery if it is well-managed. Population trends should be carefully explored for that purpose.

Lobsters / Crayfish

Mainly spiny lobsters are exploited and reported from the Park area. A 1995 survey found low counts of lobsters on coastal and inner patch reefs, and no dedicated surveys had been conducted since then. Reef health monitoring recorded that spiny lobster densities seemed to vary largely between closed and open reefs (Wells et al. 2007), and tended to be higher on closed reefs and should be continuously monitored.

Mollusks / Shells

Low counts of giant clams (*Tridacna* spp.) and spider conches (*Lambis* spp.) were recorded for coastal and inner patch reefs (Wells et al. 2007). Populations seemed to have remained relatively stable.

Urchins and Starfish

Densities of the non-fishery sea urchins and starfish seemed highly variable and differed significantly between open and closed reefs in the Park area. At two reefs that were reopened in 2000, a decrease of 50% density in urchins was noted (Verheij et al. 2004). In 2005, sea urchins were more abundant on offshore reefs to the north of the park, as well as on open reefs, which tend to be more declined and damaged (Othina and Samoilys, 2005). An outbreak of Crown of Thorns Starfish (*Acanthaster planci*, COTs), known as highly damaging to coral reefs, was reported just north of the park on Mijimile Ndogo reef and removed in 2004.



Starfish in TACMP

Sea Cucumbers

Population densities of sea cucumbers vary largely with drops in March and peaks in November, but overall the populations have remained stable between 2000 and 2007 with 0.7-1.0 specimen per 50m². Sea cucumber densities in Tanga were considered to be low, and population trends need to be further explored (Wells et al. 2007).

2.5.10. Marine Turtles

Three species of marine turtles are found in Tanga waters: olive ridley (*Lepidochelys olivacea*), green turtle (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*). All three species are endangered. Turtle populations in Tanzania have generally declined, mainly due to loss of the nesting sites (e.g. Maziwe Island south of the park boundary no longer supports nesting populations of these species) but also due to incidental and deliberate capture in gill nets. Pangani District, south of the park boundary, is still considered an important feeding and nesting area for marine turtles. Taking of turtles is prohibited (section 13 of Fisheries Regulations 1989).



Marine turtle found in TACMP

2.5.11. Marine Mammals

The dugong (*Dugong dugong*) is considered endangered in Tanzania and worldwide and is protected under the Marine Parks and Reserves Act No. 29 of 1994. Dugongs were known to inhabit seagrass beds off the Tanga coast. Today sightings are highly irregular: In May 2006 a dugong was sighted by divers at 10m depth near Kigombe, one was caught in 2000 at Buyuni near Pangani, and a small population might still exist near the Kenyan border at Mbaya / Kigomeni.

Dolphins used to be seen regularly, however sightings have become more occasional over the last 10 years (Wells *et al.* 2007). The most common species are Spinner (*Stenella longirostris*) and Humpback dolphins (*Sousa chinensis*). Humpback whales, *Megaptera novaeangliae*, pass by the Tanga coast on the migration around August - September.

2.5.12. Shorebirds

The mangrove swamps, coastal wetlands, salt pans and sand banks in the park area provide suitable feeding and roosting habitats for a number of bird species such as egrets and migrant waders. Important species that can be found in Tanga region include the Greater Sand Plover (*Charadrius leschenaultii*), Curlew Sandpiper (*Calidris ferruginea*) and Crab Plover (*Dromas ardeola*). Kibo Salt pans (300 ha) in northern Tanga is an Important Bird Area. An area 4400ha South of Tanga and just outside the park is an Important Bird roosting / feeding area.



Crab Plover (*Dromas ardeola*) in TACMP

2.6. HUMAN ACTIVITIES AND NATURAL RESOURCE USE

2.6.1. Socio-economic Context

An estimated 45,000 people reside within the Park compared with some 23,000 in Mafia and about 44,000 in Mnazi Bay Ruvuma Estuary Marine Park. There are 9 villages and 9 localities in Tanga city (Mitaa), 7 villages are in Tanga City and 2 are in Muheza District. The population of Tanga City is about 243,580 (2002 census, URT 2008).

Coastal communities are generally poor; most of them are living below or close to the poverty line, reflecting the national situation where an estimated 85% of people living on the coast survive on less than US\$1.00 a day (Ruitenbeek *et al.* 2004).

Livelihood activities within the villages along the Tanga coastal area are primarily based on marine resources, most commonly fishing and small businesses, trading in fish and fish products, (Harrison, 2010). Most people depend on the artisanal fishery, which is by far the most important economic activity. In Tanga City, fishing is the livelihood for 25-30% of the adult male population, whereas in rural areas the percentage can be as high as 70-80% (Gorman, 1995). Other livelihoods for the Park communities include agriculture, fish trading, petty trade, boat building, salt making (boiling and solar salt production), charcoal making, mangrove pole cutting, tourism and seaweed farming (Horrill, 2001). All these activities are largely affected by the seasons. Large scale commercial activities include, trading and exporting of fish and other marine products, mangrove pole cutting, tourism industry, salt making, and mining.

2.6.2. Artisanal Fishery

Artisanal fishery is the mainstay of up to 80% of the adult male population in the villages, and about 25-30% in semi-urban area of Tanga City, whereas overall it is estimated that there are about 4,300 fishermen in Tanga region and 900 fishing vessels. According to the government statistics there were 2,010 licensed fishermen in Tanga City in 2006 and 469 fishing vessels, whereas in Muheza District there were 1,130 licensed fishermen and 268 fishing vessels (URT, 2008). Artisanal fishery is mainly undertaken by men, however, women fish in shallow waters for prawns (uduvi), and a large number of them process fish and collect octopus and molluscs at low tide (Wells *et al.* 2005).

The coastal fishery in Tanga Region is multi-gear and multi-species, and largely based on coral reef and seagrass habitats, as seen in many tropical parts of the world. During the Southeast Monsoon (April-October), when there are stronger winds and rough seas, fishing activities are confined to inshore waters but in the calmer period of the Northeast Monsoon (November-March), boats fish further offshore. Distances travelled are also limited by the lack of ice and storage facilities, and by the size of the fishing vessels (Wells *et al.* 2005). The majority of fishing vessels are small and sail-powered and are operated by the owners of the vessels. Dugout canoes and larger wooden vessels are most commonly used, many fishing within the inshore waters. The larger pull nets and purse seine nets operations involve about 20 fishermen at once. Common fishing vessels include:-

- Dugout canoes with out-riggers (ngalawa): propelled by sail, ranging from 3-6.5m long
- Simple dugout canoe, (mtumbwi) propelled by paddles or small sail, ranging from 2-4.5m long
- Dhow with wooden planks, pointed bow and stern (dau), propelled by sail, ranging from 3-6m long
- Large wooden planked boat (mashua) with flat stern, propelled by sail or engine ranging from 6-12m long
- Fibre-glass boat (boti) propelled by engine, ranging from 3-10m long
-

A variety of fishing gears are used and villages have particular preferences for certain gear types. The main gears are handlines and fish traps, followed by gill nets and shark nets. Ring nets, scoop nets, longlines, trolls (for pelagics), entanglement nets, pull seine nets, stake nets, spears and spear guns, are also being used. Incidences of illegal fishing with explosives are decreasing. A summary table of the fishing gears and practices can be found in chapter 3.

A large number of species are taken, and composition varies according to gear type, season and habitat (e.g. whether reefs or seagrass beds), and other fishing grounds. The predominant finfish groups are emperors and snappers (changu), rabbitfish (chafi), rays, sharks, kingfish, and other large fish, and small sardines (dagaa). Handlines are mostly catching snappers and emperors (39%) and rabbitfish (19%); fish traps predominantly rabbitfish (81%); and shark nets catch mostly rays (71%) (Anderson, 2004).

An analysis of catches landed at Kigombe village from 1995-1999 showed that 40% was inshore fish, 32% rays, 21% offshore fish, 6% sharks, and 1% other species (Horrill, 1999). The spectrum of invertebrate species fished includes prawns (uduvi), octopus, sea cucumber, spiny lobster, wide variety of molluscs. There are at least 50 known fishing grounds in the Park area (Wells *et al.* 2007), among which the following are most commonly used (north to south): Jambe, Karange, Majivike, Chanjale, Upangu, Funguni, Kange, Kandacha, Taa, Kitanga and Rasini. The fishing grounds of Topeni (between patch reefs) and Mkondoni (beyond outer reefs) is described as open water (Wells *et al.* 2007). Most villages have a home range fishing grounds shared with other villages; fishing grounds of Karange and Funguni near Tanga City are heavily fished due to proximity to Tanga's markets.

2.6.3. Shore-based Collection (Gleaning) ban

Gleaning on foot takes place in the intertidal areas during low tide, and particularly on spring/neap tide days. Prawns are exploited mainly by women in and around Geza using drag nets and cast nets, especially during the rains when they are abundant. Octopus is collected from intertidal reef flats or sub-tidal inner reefs, on foot or by snorkeling/skin diving. Collection of sea cucumbers is currently banned. A wide variety of bivalve mollusks and some gastropods are collected for food at household level and for their ornamental shells in the curio trade. They are occasionally used for lime production. Algal species are used for different purposes in Tanga including treatment of fresh wounds by *Ulva fasciata*; whereas *Enteromorpha spp.*, *Laurencia papillosa*, *Acanthophora spicifera* and other *Ulva spp.* are commonly used as fish bait in 'madema' traps. At Kipumbwi, green algae species is used as a vegetable and for traditional medicine (UNEP, 2001).

2.6.4. Fish Processing and Trading

As common in many parts of the world, women play a major role in trading and or processing the fish catch, along with fishing and collection of sea products from shore. Local consumption is mainly fresh unprocessed fish, although some fish are also smoked and sun-dried.

Most people sell their fish, agricultural products, and other products at local market. Sales are almost entirely on a cash basis (Harrison, 2010). In Tanga City, many of the fishermen who fish for octopus, lobster, or other seafood, sell their products to the few seafood processing companies (e.g. SEAPROD Inc). Whereas previously the processors were buying the products directly from fishermen, presently they are buying from middlemen (village-level company representatives). Statistics show that combined export figures in 2006 for the two main seafood companies (Tanga Sea Products and Bahari Food) were as follows; 449,662 kg for octopus, 22,209 kg for cuttle fish, 1,184 kg for squids, 1,901 kg for crabs and 664 kg for lobster tail (URT, 2008).

2.6.5. Agriculture and Livestock Keeping

The major agricultural products in the coastal areas are cashew nuts, coconuts, cassava, rice, maize, potatoes, sisal, vegetables and tropical fruits such as, tomatoes, oranges, mangoes and bananas.

Local livestock includes cattle, goats, sheep, pigs, chicken, and ducks. Sisal, introduced by the Germans in 1903, is an important cash crop in Tanga region, and despite a substantial breakdown in the global market it is still grown in large scale by private or state-owned estates. Coastal agriculture is otherwise predominantly small scale, labour intensive and requires little capital (UNEP, 2001).

There are occasional announcements of attracting large scale investments in agricultural production and commercial livestock herding, which, if implemented, may threaten the integrity of park or buffer zone.

2.6.6. Mariculture

Depending on the location of suitable habitat, mariculture initiatives in the villages include: milkfish pond farming in the salt flats behind the mangroves; crab fattening in the mangroves; and seaweed farming in shallow waters of sandy beaches. All initiatives are small scale at the household or village level.

Community-based mariculture is still relatively undeveloped in Tanga region, and is not yet creating significant and sustainable profits due to the small scales of production, lack of physical and technical inputs, lack of capacity to meet market quality and quantity demands, and in some cases lack of suitable markets, market access, and financial constraints such as shortage of investment capital. However, there is a growing potential and a viable option for food security in many villages if effort is invested to build technical skills (Samoilys and Kanyange, 2008).

Culturing prawns, milkfish, and oyster has been tried but is not sustainable because of low or unreliable seed availability. Mangrove crab fattening has been successfully tried and is currently promoted together with hatchery development throughout the region. Young crabs are captured from the wild and then fattened in individual wooden cages in the mangroves. Challenges remain on quality requirements, financial constraints, production size and suitable markets (Wells *et al.* 2007). This situation might change when suitable hatcheries are constructed for mangrove crabs in Tanga (currently there are no hatcheries in Tanzania). The establishment of mangrove crab hatcheries should be taken as a challenge in value enhancement in the crab fishery.

Seaweed collection and farming in Tanga involves two major introduced species namely *Kappaphycus alvarezii* (formerly known as *Eucheuma cortonii*) and *Eucheuma spinosum* and their production has increased dramatically in Tanga over the last 10-15 years, due to the overall growth in the industry nationally and promotion by the private sector. Seaweed farming is practiced at small-scale and can be viewed as a supplementary livelihood. It involves hard labor and income is considered lower than that generated from fishing. So far, seaweed farming does not relieve much pressure on the fishery resources as it is carried out predominantly by women, while fishery resources are exploited mainly by men (Harrison, 2010). It however benefits women considerably and reduces impact of other traditionally female activities, such as reef gleaning and collection of firewood.

2.6.7. Mangrove Harvest and Beekeeping

Mangroves are used as building poles for houses, ribs for boat building, firewood and charcoal for household cooking and small business, fish smoking, salt making, for tannin and traditional medicines. Many people inside the park depend on mangrove forests as a source of building materials and economic livelihood: 38% of the materials for buildings are sourced from mangrove forests. Most people also rely on fuel wood or charcoal made from mangroves for cooking. The TCZCDP was able to considerably reduce the pressure on mangroves by instigating a management system that is largely still intact (Wells *et al.* 2007). Main issues to mangrove conservation are the loss of area due to clearance for industrial sites, housing, agriculture, salt pans, and mariculture (IUCN, 1987; Harrison, 2010).

Beekeeping is an increasingly relevant and expanding activity in the park area, as well as in Tanga region more broadly. Currently 28% of the populations inside the Park are engaged in beekeeping activities, which is undertaken in mangrove forests (Harrison, 2010). In 2006, there were 6,252 traditional beehives in Muheza District none in Tanga City, and about 919 modern beehives in Tanga region (URT, 2008).

2.6.8. Salt production

Solar evaporation is most widely used method in producing salt in Tanga as it is least capital-intensive and normally carried out during the dry season. Kibo Match in northern Tanga (Mkinga District) conducts one of Tanzania's largest salt mining businesses using solar evaporation, with 909.3 tones valued at 35.6 million TSH in 2006 (URT, 2008). In the Park salt is produced at Mwarongo, Mchukuuni and Machui and Chumvini villages.

Salt is also produced through boiling by small-scale miners, using a comparatively large amount of firewood mostly from mangrove forests. It is estimated that it takes two truckloads of wood to produce 1.4t of salt when using a boiling pan. Almost all the salt produced along the coast is sold to the internal market.

2.6.9. Coral Mining and Mineral Exploitation

Corals are mined at a small-scale for construction materials (building blocks and production of lime). Usually ancient fossilized coral reefs from further inland and below ground are used in Tanga, however, occasionally live and dead coral from the sea are used. The latter causes damage to coral reef habitats and ecosystems. To produce lime, coral is burnt in a kiln, often using firewood from mangroves. Tanga Cement Company officially exploits limestone at Amboni in Tanga and is one of the three biggest cement plants in Tanzania. In 2006 it produced 63,363 t of cement with a value of about 1.6 billion TSH (URT, 2008). Tanga region is also rich in minerals like amethyst, garnets, tourmaline, kyanite, gypsum, feldspar, kornepine, zircon, bauxite, ruby, turquoise, rhodolite, sapphire, graphite, marble, chrysoberyl, alexandrite, and gold. All these are exploited.

2.7. CULTURAL HERITAGE

A number of historical buildings, ruins and monuments inside the park area hold both the traditional value and potential as cultural attractions for tourism. Tanga City's historical centre is said to be a unique cultural asset to the region. However, a policy of heritage conservation has yet to be developed. Tongoni ruins, about 17 km south of Tanga City, show remainders of a 15th Century trading centre. They consist of mosques and tombs, and remains of residential houses of the first Shirazi of Persian origin. The old Ndumi village ruins (Ras Nyamakuu) are composed of sections of a town wall that was built in defence against marauding Maasai in the 19th century. Remainders are old graves and house foundations; a mangrove creek area where the old dhow trading centre used to be; and area where coins, beads and shards of pottery are said to still be found (TATONA, 2010). There are further ruins on Toten Island in Tanga Bay.

CHAPTER 3

MANAGEMENT ISSUES AND OPPORTUNITIES

There have been several workshops and consultative meetings held between the Marine Parks and Reserves Unit and stakeholders since 2007. These, together with the experiences of Marine Parks and Reserves Unit management, have identified several management issues and opportunities that constitute to the basis of a need for special management effort in Tanga Coelacanth Marine Park. These have been grouped under the following categories:

- Natural resource issues
- Socio-economic issues
- Opportunities

3.1. NATURAL RESOURCE ISSUES

3.1.1. Destructive and Illegal Fishing Practice

Much of the pressure on fisheries and degradation of reef ecosystems in Tanzania has been caused by destructive fishing methods. Destructive fishing methods are illegal, but continue to be used due to inadequate enforcement, high profitability, highly organized informal business networks and increasing competition for marine harvests by legal means. By far, the most destructive human impact on coral reef ecosystems and fisheries productivity is fishing with dynamite or other explosives and small-meshed drag nets including beach seines and boat seines.

The use of poison for killing fish has been reported to occur both in Muheza and Tanga Districts at a small scale. Several gear types are legal but potentially destructive when not used in the way or location for which they are intended.

Table 3.1 Diversity of fishing fleets and methods, and the damaging potential

Gear	Main Species	Use characteristics	Boat used	Damage potential
hand-line (mshipi)	carnivorous reef fish: groupers, snappers, emperors	most common, shallow water, inexpensive, traditional	ngalawa, mtumbwi	little collateral environmental damage
fish trap (madema)	herbivorous reef fish: parrot, surgeon, rabbitfish	second most common, placed in shallow water seagrass and on sand, traditional	ngalawa, mtumbwi	depending on size and setting, can be damaging with tidal movements
gill-net (5-10cm, 2-4") (nyavu ndogo)	larger fish and pelagics: mullet, sole, trevally	used in deeper water on the surface, mid water or bottom, 1-several units, labour-intensive, introduced in 1960s, still legal	ngalawa, mtumbwi, mashua, dau	By-catch of turtles and sharks, (juveniles)
shark (gill) net (12-30cm, 5-12") (jarife / sinia)	rays, skates, sharks, kingfish	jarife: used on surface, drifting, sometimes deeper waters. Introduced 1982. sinia: bottom set, drifting. several units	ngalawa, mtumbwi, mashua, dau	By-catch of turtles, coelacanth, sharks, pot. bottom habitat damage, misuse as 'ghosts', main spec. rays considered vulnerable but unexplored
ring net / purse (seine / ringi)	sardines. small meshes target fusiliers, bonito, trevally	open water at night around new moon, expensive, labour-intensive crews 10-20, seasonal fishery, legal	mashua, madau	finer meshes used during day with high juvenile by-catch of snappers and emperors
scoop net (senga)	prawns	various use techniques	foot, ngalawa, mtumbwi	juvenile by-catch
beach seine / pull seine net (juya / makoro)	emperors, jacks, anchovies, herrings, sardines	illegal from 1998, dragged from beach or boat with 10-20 men, expensive, still used	foot	highly destructive effects on sensitive bottom habitats
long-line kaputi / (dhulumati)	larger finfish e.g. tuna, swordfish	max 10 baited hooks, set on bottom over night near shallow reefs	ngalawa, mtumbwi	high by-catch rates of mammals, turtles, seabirds
cast net (vimia / kimia)	small fry and fish bait, prawns	caught off the beach, Geza, espec. during rains, and by women	foot	juvenile by-catch
spear (bunduki)	octopus, spiny lobster, some bigger fin-fish like jacks or grouper	illegal from 1970 if propelled, widely used & inexpensive, on foot or snorkeling	skin dive, snorkel	fairly selective
explosives / dynamite (baruti)	unselective	illegal, inexpensive & available, from boat or snorkel	ngalawa, mtumbwi, snorkel	see 3.1.1
Poisons (sumu)	unselective	illegal, inexpensive but less available, from boat or snorkel	ngalawa, mtumbwi, snorkel	see 3.1.1

Use of Dynamite

Dynamiting kills and injures large, non-selective quantity of fish; and the blasts cause immediate destruction of the coral communities leaving behind rubble and broken coral structures on which most fishery resources and all other reef species rely for shelter, reproduction and sources of food. Moreover, profound impact is on coral recruitment, as blasts remove viable seed populations of corals for potential re-colonization or recovery (Nzali *et al.* 1998). Continued blasting can thereby completely destroy a healthy reef system and its surroundings, which may never recover often due to phase shift to an algal dominated ecosystem of lower species diversity, whose productivity for sustaining fisheries is greatly reduced (Samoilys & Kanyange, 2008). The damaged reef ecosystems in the Park, may affect the livelihoods of most artisanal fishers within and around the park. In addition, it is a serious threat posed to the developing coastal tourism sector in Tanga region, which again hinders local communities from picking up alternative income-generating activities related to tourism industry.

Use of Beach Seine Nets

Beach seines (or 'juya', 'kavogo' etc.) cause damage particularly to sedentary marine life and destroy fragile coral growth, when weighted small mesh nets are dragged across the seabed to catch fish on the bottom of shallow water reef areas and estuaries. When used in coral areas, such dragnets can quickly destroy large areas of coral that will take decades to recover. In areas where fragile corals grow, this form of fishing is almost as destructive as the use of dynamite. Some techniques additionally involve beating and smashing coral colonies with poles to frighten fish into the net. The small-mesh size of seine nets furthermore results in the capture of many juveniles. Capture of juvenile fish, when conducted intensively in nursery areas, again results in depletion of fish stocks, alteration of species composition, loss of species diversity, and disruption of food webs. Beach seines are illegal as per Fisheries Act of 2003; and Marine Parks and Reserves Act No. 29 of 1994.

3.1.2. Fishing Pressure and Unregulated Fishing

Fishing pressure has been steadily increasing over the past years, with clear signs of 'diminishing returns' and over-fishing across the major target fisheries, though not always detectable for lack of comprehensive effort and catch data.

The following key observations have been made on the fishing pressure and gears used in Tanga region including the Park:

- High variability of Catch Per Unit Effort (CPUE) has been recorded,
- Numerous invertebrate species are heavily exploited, such as prawns, octopus, spiny lobsters, sea cucumbers and molluscs,
- Tanga City has by far the greatest number of fishers. Migrant fishers come from Pemba and Zanzibar, other areas on the mainland coast and within Tanga Region itself and set up camp for 2-3 months at certain locations, depending on seasonal variations in productivity of fishing grounds. Potential conflict exists with regards to access rights and social interactions.

Overfishing

Analyses of seven years of monitoring data 1998-2004 showed that densities of certain fish groups, particularly the commercially important species such as the carnivores (groupers, snappers and emperors) and omnivores (grunts/sweet lips and goatfish), are generally declining since the 1990s. A 5–6 fold decline in all fish groups, particularly in snappers and emperors, was recorded in 2003 and largely persisted at least to 2007. These results suggest that the long term sustainability of the main artisanal reef fisheries in Tanga region is in question under current fishing practices. Numerous and varying gear types are used for fishing, including destructive gears (small meshed nets). Restriction of fishing based on area, time and gear regulations should therefore be applied. Growing commercial fishing for prawns, octopus, lobster, and shells for both export and local sale should also be carefully considered, as shells, and lobsters are said to be over-exploited. It is also essential to consider the effects of overfishing in the areas adjacent to the park.

3.1.3. Endangered Species

Coelacanth By-catch

Between August 2003 and September 2005, 25 coelacanths had been caught in Tanzania, 19 of which were captured in TACMP area over a period of only 6 months, including pregnant females. This is the greatest number of Coelacanths caught in the shortest time anywhere in the world, suggesting that the species is under considerable pressure and in critical need of protection. The Coelacanth was caught incidentally in deep-set shark nets ('jarife'). It is possible that declining fish stocks in inshore waters have caused gill nets to be set in increasingly deeper waters. It is difficult to ascertain the population of Coelacanth because of their deep habitat (from 150-250m). However, records in the Park show catches at about 70m depth. Pending studies to establish the status of its population, ecology and habitat, the Government has restricted the use of jarife in Coelacanth habitat in the Park.

Marine Turtles, Dugong, other Marine Mammals

The extensive seagrass beds and coral reefs of TACMP provide suitable habitats for sea turtles and marine mammals. However, such habitats are threatened by unsustainable use and subsequent degradation (e.g. Maziwe Island). Consequently, nesting populations of marine turtles are said to have been declining rapidly in Tanga due to loss of nesting habitat, incidental catches mostly in gill nets, as well as widespread poaching of both turtles and their eggs.

Information on the current status, distribution and abundance of cetaceans (dolphins and whales) is limited. Tourist hotels inside the Park maintain a turtle monitoring programme and have also reported that dolphin sightings have been rapidly declining over the past 5-10 years. The presence of dugongs in the park area is largely unconfirmed despite the sighting of a specimen in Kigombe in 2006. A dedicated population status assessment for these species groups is not yet available but highly recommended. Inclusion of national and regional conservation strategies for these species should be considered for the marine park.

3.1.4. Unsustainable Mangrove Harvest

The main potential threats to mangroves in Tanga region are forest clearance for industrial sites, housing, agriculture, salt pans, and mariculture. Other significant pressures on wood resources include cutting for household cooking, charcoal production, domestic building poles, boat-building and fuel wood (including producing lime from coral though to a smaller extent). These pressures have been generally increasing, and may continue to do so with growing population numbers and imminent needs for livelihood development inside the park area. A potentially significant threat to mangroves within the Park is furthermore posed by planned construction of a deep-water port in Mwambani Bay, which if implemented would considerably impact on the surrounding creeks of Ras Nyamakuu and Mchukuuni.

Clear-cutting, unsustainable fishing methods, the harvesting of macro fauna, collection of molluscs and erosion are further threats to the existing mangrove ecosystems. However, Tanga and Muheza Districts showed slight increase in mangrove cover due to recent reforestation efforts. This is largely attributed to management and replanting efforts by community-based programmes, in collaboration with the National Mangrove Management Project (MMP).

3.1.6. Beach Erosion and Pollution

Erosion is a natural process that is often dynamically balanced with accumulation of sediments in other places or at different times. However, it is severely exacerbated by human activities and particularly by removal of natural sediment traps and tidal barriers such as mangrove ecosystems. Sand, gravel and coral limestone mining from the shore also contribute to accelerated erosion and are practiced in the Park. Within the Park there is a high level of beach erosion in some areas. This poses a human challenge to coastal settlements close to the shore through high amplitude tidal movement and strong wave action during the south-east monsoon period. Regarding pollution there are inadequate solid and liquid waste management systems and a number of beaches are polluted by human excreta. A potential threat of water pollution stems from high levels of waste water and proximity of the sisal and cement making industries.

3.2. SOCIO-ECONOMIC ISSUES

A number of socio-economic issues were assessed to contribute to the Park planning (Harrison, 2010; Gorman, 1995), and have been identified and prioritized by stakeholders in the preparation of this GMP (Martin, 2011). The main issues facing sustainability of livelihoods in the Park area are briefly described below.

Local livelihoods within the Park are characterized by high dependence on natural resources. Despite a comparatively low official figure for licensed fishers, previous socioeconomic studies showed that an overwhelming majority of villagers in the Park depend on artisanal fisheries for their living. The main limitations identified by stakeholders and community members within the Park are: access to markets, capital, health, and a lack of modern equipment. Other limitations include education, employment, income, transportation and water.

3.2.1. Market Access and other Post-harvest Operations

Communities within the park in many cases have enough resources and products from fisheries and agricultural activities to translate into sufficient incomes if sold. However, the lack of access to markets for most of the Park fisher communities results in low earnings for harvests and/or products. Harisson (2010) attributes this to two main reasons: firstly, lack of power to negotiate higher prices, because of limited or unsustainable supplies and high dependence on seasons and weather conditions. Secondly, deficient transport, storage or packaging. Fish transport is mainly by boat, which is expensive and depends on sea conditions. Inadequate accessible cooling facilities to artisanal fishers and so unprocessed fish must be sold immediately. Furthermore, in many cases, buyers demand certain minimum amounts of the product which cannot always be met and hence, preventing community members to access a market.

Currently, there is no coordinated governmental support to post-harvest operations and marketing and the revenue earned by fishers is very susceptible to the market changes. Support to post-harvest processing and storage facilities for meeting the required standards and increase value addition, as well as marketing issues should be urgently addressed as this is critical to the optimal use of fisheries resources.

3.2.2. Income and Access to Financial Capital

Local communities within the Park villages cited a lack of income as a major socio-economic challenge to meeting basic household needs, as a severe limitation to invest in their future. A major constraint to the improvement of particularly fishing operations and economic income for fishers is the missing access to affordable credit schemes and therefore inability to generate savings for necessary investments in suitable gears, vessels, storage and other equipment.

It is common for fishing communities to view fishing as a way of subsistence and not a gainful employment or business with potential for growth and improving livelihoods (Ochiewo *et al.* 2009).

However, appropriate microcredit programmes and investments in more sustainable fishing practice and business operations are a potential solution if the following issues / barriers are simultaneously addressed:

- Encourage a culture of saving and obtaining credits
- Provide guidance on loan management
- Support employment and income above subsistence level for initial joining fee; ability to invest and repay loans
- Facilitate transportation to access loan institutions and
- Ensure that microcredit programme does not require title deed to land.
-

3.2.3. Access to Equipment and Technology

Most of the community members in the Park lack modern equipment, which restricts the type and amount of fish they can harvest, and often pose significant damage to the marine environment. Most are limited to fishing in shallow waters, where fishing pressure is considered unsustainable. Modern equipment would enable fishing communities to engage in more sustainable fishing methods and also access different fishery resources. In addition to the above, they also lack appropriate technology to carry out fishing, processing and related activities. In part, this problem would be solved by addressing capital and training, but on another level this issue requires intervention because a particular type of gear introduced may have adverse effects on the local ecology (Harrison, 2005b).

3.2.4. Education and Training

Currently, access to knowledge and training is a major limitation in the Park area. Most community members have primary school education, and many of the villages do not have nursery schools. For the schools that do exist, teachers, laboratories and classrooms have always been inadequate. However, the situation is improving as more secondary schools are being established at the ward level.

3.2.5. Unemployment

Access to formal employment opportunities is scarce across the local communities within the Park, with *formally* 98% of community members being unemployed (Harrison, 2010). Usually, people find a way to earn income with the few resources that they have, which is often related to harvesting and selling fish. In this informal 'grey' economy, small businessmen and fishers represent the highest percentage of household activities, both 17-18%. About 64% of people interviewed in a recent study reported that the amount received is not enough to cover living expenses (Harrison, 2010).

3.2.6. Governance, Enforcement and Compliance

Illegal resource use spreads across different sectors often as a highly organized practice despite national laws that prohibit it. In the case of dynamite fishing, for example, yields and earnings are relatively higher compared to most traditional fishing methods. The practice is resurfacing rapidly, apparently due to uncoordinated enforcement and weak prosecution. It should however be noted that only a minority of coastal fishers engage in this practice in Tanga, but that the majority of fishers are strongly opposed to it and are supportive of increased enforcement and more efficient governance frameworks to tackle and eradicate the issue. A collective zero-tolerance policy and improved follow-through at all levels is needed, including greater pressure for change, in collaboration with local communities.

3.2.7. Transportation and other Infrastructure

Despite construction of the tarmac road from Dar es Salaam to Tanga City, transportation remains a key problem for the Park communities, with two major implications: access to health care facilities is too difficult and this negatively impacts local health, and communities cannot access markets to sell items such as fish, jewelries, and carpets. Some roads are impassable during rain seasons.

3.2.8. Seasonality

Fishing livelihoods are largely affected by monsoons, and agriculture livelihoods are largely affected by the short and long rainy seasons. During droughts, the cost of living is especially high. *Kaskazi* (October to April) generally considered a time of relatively well-being for lack of heavy rains, and most income generating activities occur during the dry season from December to March. The best time for agriculture as well as fishing crop supplies is in October. During *Kusi* (May to July) the level of diseases affecting people is higher and generally harvests are poorer. June and July are considered particularly difficult months because fewer fishing resources are available as a result of the heavy rains.

3.3. OPPORTUNITIES

3.3.1. Livelihood Enhancement

Enhancing income-generating alternatives and the diversification of livelihoods are crucial means for providing food security in Tanga, as they reduce the overall risk to communities if one source of income is depended upon, for example, 'fishing or a fishery' when collapses due to over-harvesting and/or climate change.

In order to improve livelihoods among residents in the Park and Tanga region in general, it is crucial to both (a) improve marine resource management for maintained or increased availability of resources, and (b) provide alternative forms of income generation to the coastal communities. In so doing, it is essential that interventions complement the existing activities of key stakeholders on the local, regional, and national levels.

According to a recent report by Harrison (2010), community members have identified the following activities and opportunities necessary to enhance their livelihoods:

- Establishing a tourism and research centre at Tongoni
- Improvement and increase in mariculture activities
- Enhancing agricultural activities
- Improved textile production
- Improved fishing, production and packaging
- Improvement and increase of beekeeping

3.3.2. Tourism

If tourism is well managed and the money goes equitably and directly to the communities, it has the potential to yield high benefits for communities. Marketing with tourist hubs and partnerships to access important markets (Nairobi, Dar es Salaam, Tanzania Tourist Board, Tanga Regional Tourist Association) will be a crucial element of this. A large portion of the profits should go to local community development projects, which again can be communicated back to tourists. For example, Mwarongo village South of Tongoni that has pristine beaches and the Tongoni ruins may attract tourists as a viable alternative to other coastal destinations. It can also be used to sell local handicrafts, traditional products and cultural items. Income generated should be used to improve communal social services according to their agreed priorities.



Tourist at Tongoni sand bank

3.3.3. Mariculture

Mariculture is still relatively undeveloped in Tanga but has growing potential, and is considered a viable alternative option for food security if effort is invested to build the necessary technical skills (Samoilys and Kanyange, 2008). If done correctly, mariculture provides communities with comparatively more stable access to food and income. Moreover, initiatives are already in place to promote mud crab cage culture, lobster sheltering and prawn farming. If improved, these can relieve fishing pressure from the wild stocks.

CHAPTER 4

MANAGEMENT GOAL AND OBJECTIVES

The goal of the Tanga Coelacanth Marine Park is to conserve marine biodiversity, resource abundance and ecosystem functions of the Park, including the Coelacanth and its habitat; and enable sustainable livelihoods and full participation of local community users and other key stakeholders in the protection, enjoyment and sustainable use of marine and coastal resources for the benefit of present and future generations.

The TACMP adopts the purposes as clearly stated in the Marine Parks and Reserves Act No. 29 of 1994, under Section 10, as the objectives of the GMP, with minor modifications to suite the emerging issues as follows:

- 1) To protect, conserve and restore the species and genetic diversity of living and non-living marine resources, while considering the threatened coelacanth and its habitat, and safeguard the ecosystem processes of the marine and coastal area;
- 2) To manage the marine and coastal area so as to promote sustainability of existing resource use; the recovery of areas and resources that have been over-exploited or otherwise damaged and to rehabilitate damaged ecosystems;
- 3) To ensure that villagers and other park residents are involved in all phases of planning, development and management of the marine park, and have priority in the resource use and economic opportunities;
- 4) To promote the rational development and sustainable use of under-utilized natural resources and emerging activities;
- 5) To promote community-oriented education and dissemination of information concerning conservation and sustainable use of resources in the marine park;
- 6) To facilitate and conduct research and monitor resource conditions and use within the marine park.
In addition, as an outcome of two stakeholders consultation workshops, participants added two more objectives for TACMP;
- 7) To facilitate and promote the development of appropriate eco-tourism;
- 8) To conserve and protect the cultural heritage of the park residents.

The identification of these objectives, and the management issues and opportunities discussed previously, form the basis for the GMP management strategies including the zoning, the monitoring and evaluation of the park. The success of implementation of this GMP depends on the extent to which these objectives are met.

CHAPTER 5

GUIDING PRINCIPLES AND MANAGEMENT STRATEGIES

This section sets the strategic framework of the GMP that will address the objectives outlined in the previous chapter. The GMP management strategies are guided by a number of principles.

5.1. GUIDING PRINCIPLES

The management of the park and the strategies of this GMP are guided by a number of ecological and socio-economic principles as outlined below.

5.1.1. Adoption of Ecosystem-based Approaches to Management

An ecosystem-based approach to management requires that the integrity of the natural ecosystem and its key components, structure and processes be up-held. This means maintaining natural species diversity and protecting critical habitat for all stages in a species' life cycle. An ecosystem approach to fisheries management aims at ensuring the production of fish as food, revenue, employment and other essential services. Hence, there is a need to cater both for sustainable human use, as well as for ecosystem well-being as emphasized by FAO (2003). *“An ecosystem approach to fisheries management strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries.”* Implementation of an ecosystem approach inevitably requires considering a range of frequently conflicting objectives where consensus may not be readily attained without equitable distribution of benefits.

5.1.2. Incorporation of the Precautionary Principle

Precautionary principle approach means, when in doubt, be cautious (preparedness). The principle recognizes that a lack of certainty about an environmental threat should not be used as an excuse for postponing measures to avoid or minimize such a threat, meaning preventive action well before an environmental harm can become irreversible or local extinction can occur. This principle therefore puts a burden of proof on any individual, organization or government agency conducting activities that may cause damage to the marine ecosystem.

5.1.3. Adoption of an Adaptive Management Approach

Adaptive management *“integrates design, management, and monitoring to systematically adapt and learn”* (Salafsky *et al.* 2002). This principle is now widely recognized as an essential element to natural resource management. Adaptive management has been applied with and by the communities inside TACMP over the last 15 years in the context of the Tanga Coastal Zone Conservation and Development Programme (TCZCDP).

In as much as local communities are consulted in the GMP development, their participation will be required further during plan implementation. The GMP will need to be fine-tuned and adapted to changing circumstances, including its subsidiary regulations which may need adjustment to a level that local residents can cope with. Some of the suggested management strategies may furthermore need to be 'fitted' to individual villages or groups of villages where the socio-economic conditions, sources and levels of pressure on the marine resources differ. Consequently, the GMP must be considered a work in progress that continuously evolves according to lessons from its initial trial, and by carefully considering inputs from authorities, affected stakeholders and study results that may become available.

5.1.4. Adoption of an Integrated Management Approach for Multiple Uses

A variety of natural resource uses sustain the inhabitants of the park, all of which are important for their livelihoods. Despite an overall high dependence on fishing, some activities are more prevalent in certain areas of the park than others (e.g. agriculture, seaweed farming, mangrove harvesting). It is clear that one single management approach will not be appropriate for the entire park. An integrated multiple-use approach however, employing zoning and a variety of other measures, can address the particular local conditions. For example, where the dependence on near-shore fishing is very high and there are no or few viable alternatives, zoning should dedicate an area solely to local artisanal fishers, whereas a ‘no-take’ area or stricter gear-limitations can be appropriate in areas primarily used for tourism. Finally, areas where coelacanths have been found at a greater depth will be placed ‘off limits’ by restricting fishing to gear that is exclusively deployed in the upper water levels. These zones and regulations have been drafted and agreed with stakeholders.

5.1.5. Collaborative Management through Community Participation

It is proven and now widely accepted that a marine park cannot possibly succeed without the full support of its local resident stakeholders. Rather, the only chance that the park succeeds to address major threats (like dynamite fishing and coelacanth by-catch) is if those who are affected by the regulations are willing to comply and cooperate because they see a benefit in the long-term sustainability of the Park’s resources. All villages and Tanga City localities (Mitaa) in the Park have been engaged in the participatory development of the GMP through village assemblies, village liaison committees (VLCs) and Advisory Committee. All these organs will be involved during the implementation of the GMP as stipulated in the Marine Parks and Reserves Act No. 29 of 1994.

5.1.6. Equitable Sharing of Costs and Benefits

The benefits of a marine park are usually seen as an increase in the value (quality and/or quantity) of the resources due to increased protection of the ecosystems. The costs can be seen as the value of extraction that is missing to the primary resource users caused by the park’s user limitations. Most often these costs are borne by the local stakeholders whose activities are curtailed, for example, when an area is closed to fishing or when a catch-efficient but destructive gear is banned. In the long run, the benefits of a marine park are expected to far outweigh the costs of increased protection. From a standpoint of equitability and compliance, it is of utmost importance that those who have borne the costs, by accepting to see their activities restricted, are also the ones who reap the benefits of the park.

Today, it is widely accepted that biodiversity conservation through protected areas should “ensure that conservation and development activities contribute to the eradication of poverty and ensure that benefits arising from the establishment and management of protected areas are fairly and equitably shared, and do so with the full participation of indigenous and local communities and, where applicable, taking into account communities’ own management systems and customary use.” (CBD, 2010).

5.1.7. Incorporation of Gender Balance Considerations in Decision-Making

Earlier assessments in Tanga showed the essential involvement of women in the harvesting and processing of marine living resources, as well as their growing role in advancing income-generating activities such as seaweed farming, tree nurseries and planting of village woodlots. Women furthermore make many household decisions that influence how and when the resources are harvested. Consequently, it is critical that their role in resource exploitation is equally reflected in women’s involvement in the management and decision-making over the resources inside the Park.

The benefits from economically empowering women through the Village Community Banks (VICOPA) microcredit scheme in other marine parks in Tanzania should furthermore be harnessed by encouraging successful women to advocate gender equality and economic activities amongst their fellow community members.

5.2. MANAGEMENT STRATEGIES

The following management objectives list a number of concrete strategies.

5.2.1. Objective: To Conserve Biodiversity, Coelacanth, and Ecosystem Processes

Strategies

- 1) Build on, update and extend existing knowledge on:-
 - Status and distribution of marine and terrestrial biodiversity within the park, in seagrass beds, coral reefs and mangroves.
 - Status and distribution of endangered or threatened species including coelacanth, turtles, dolphins, whale sharks, whales and dugongs.
 - Status in the buffer zone of the same species and habitats as above.
 - Ecological processes responsible for maintaining the productivity and diversity of marine and terrestrial resources, including, spawning grounds, current patterns, seed and larvae dispersal and recruitment, and reproductive cycles particularly of commercially exploited species like sea cucumbers, octopus, and spiny lobsters.
- 2) Collate all information on the species, habitats and ecosystem processes in GIS format,
- 3) Identify threats to individual critical and threatened habitats, species and ecosystems, as they evolve, and take appropriate measures through temporary closure for recovery and the designation of no-take zones.
- 4) Eliminate illegal resource-use practices that are damaging to critical habitats and/or species and ecosystems processes.
- 5) Strengthen effective enforcement of regulations and orders through patrol and community based enforcement.
- 6) Consider all potential development plans in relations to the existing zones.
- 7) Implement national legislation prohibiting the taking, use and trade of endangered species such as coelacanth, dugong and turtles and other organisms.
- 8) Establish conservation plans for endangered species including coelacanth, turtles, dolphins, dugong and others.

5.2.2. Objective: To promote sustainable Use of Marine Resources and Rehabilitate the Damaged Resources

Strategies

- 1) Eliminate unsustainable and destructive resource use practices including dynamite fishing, beach seining, illegal mangrove harvesting.
- 2) Implement zoning plan to protect critical habitats (mangroves, coral reefs, sand beaches and seagrass beds) in collaboration with local users and park residents.
- 3) Control migrant fishers by establishing a register of resident fishers in the park and screen migrant fishers through permits.
- 4) Promote environmentally friendly fishing gears through community based trials of innovative gears, and small-loan schemes.
- 5) Promote supplementary income generating activities including mariculture, tourism related enterprises, bee-keeping, hand crafts, etc. to expand income base and reduce involvement in unsustainable resource use activities.
- 6) Rehabilitate degraded environment where appropriate through planting and transplantation activities, and if possible, through temporary closures.

5.2.3. Objective: To promote Community Participation in Management, Benefit-Sharing and Access to Resources

Strategies

- 1) Ensure that benefits from economic developments including eco-tourism, resource extraction, and other emerging economic activities are shared with the local communities.
- 2) Develop community-based collaborative enforcement mechanisms, to enhance compliance with Park regulations.

- 3) Strengthen the capacity of Village Liaison Committees (VLC) to participate fully in the management coordination and implementation of the park roles.
- 4) Facilitate community members to establish and access loans, micro-credits (SACCOS and VICOBA) to enable them manage small scale enterprises in order to broaden income base for the purpose of reducing poverty within the community.
- 5) Develop an appropriate formal agreement with Muheza District Council and Tanga City to guide a productive and cooperative relationship that addresses the interest and concerns of all parties.

5.2.4. Objective: To promote Community Education and Information Sharing

Strategies

- 1) Ensure all key working documents, including the GMP and relevant policies and legislations, are translated in Kiswahili and widely distributed.
- 2) Conduct a needs assessment study to understand the current status of environmental awareness and education.
- 3) Develop an integrated programme of environmental education that:
 - Identifies and targets priority groups within the community, such as schools, women groups, village elders, religious leaders, judiciary and resource users.
 - Disseminates information on the objectives of the Park, fundamentals of marine and mangrove ecology and impacts of unsustainable resource use.
 - Utilizes a variety of formats and tools of interpretative media including newsletters, brochures, schools materials, teacher training and video media.
 - Raises awareness on the ecology and its role and importance of Coelacanth in the Park ecosystem, also new information can be used as it becomes available.
- 4) Actively promote a culture of information-sharing and transparency in decision-making through regular dialogue with all stakeholders, including residents of the buffer zone.
- 5) Develop incentives or small-scale award schemes for best environmental practice.
- 6) Develop a TACMP information centre that provides display and give-away information to visitors.

5.2.5. Objective: To Develop Under-Utilized Resources and Emerging Activities Sustainably

Strategies

- 1) Identify and assess under-utilized resources including their distribution abundance and potential for sustainable utilization.
- 2) Develop management plans of the under-utilized resources by involving the community.
- 3) Encourage private sector involvements in developing under-utilized resources where it is in the interest of the resident communities.
- 4) Facilitate the investigation and development of markets for under-utilized resources.
- 5) Support the development of any new fisheries and other fisheries related activities that entails partnership between local stakeholders and investors.
- 6) Ensure all economic development and construction activities including e.g. infrastructure development, port construction, buildings for commercial purposes, oil or gas exploration are subjected to Environmental Impact Assessments (EIAs) according to formal procedures set out by NEMC and adapted by MPRU, and that such EIA address ecological, social, economic, cultural and aesthetic viability.
- 7) Encourage the private sector to train entrepreneurship skills to local communities for tourism business, seafood processing and trade, agriculture, forestry and bee-keeping, mariculture and maritime.

5.2.6. Objective: To facilitate and conduct Research and Monitoring of Resources

Strategies

- 1) Prioritize research and monitoring that will provide critical management information for the Park including the status of biodiversity and habitats, sustainable levels of use of important resources and community demographic and livelihoods.
- 2) Involve the local community in research and monitoring of resource condition and use where appropriate.
- 3) Develop a detailed monitoring and assessment programme, ensuring that all critical aspects of resources and resource use are monitored at regular intervals.
- 4) Develop, where appropriate, a reward scheme in the monitoring of resource condition and use to local communities.
- 5) Collaborate with local and foreign scientific institutions to fill in outstanding data requirements, not covered by the internal monitoring capacity.
- 6) Provide incentives to attract available research capacity to TACMP and to encourage it to focus on the marine park's research priorities.
- 7) Ensure that all scientific results are made available, and disseminated in a timely manner in order for the Park to benefit.
- 8) Continuously monitor bio-physical and socio-economic changes relevant to the respective resources inside the park.
- 9) Maintain data base of all research findings and link with MPRU HQ.

5.2.7. Objective: To promote the development of eco-tourism

Strategies

- 1) Promote development of small-scale, low-impact eco-tourism developments, and encourage use of local services for e.g. boat tours and transport, while encouraging the development of high value low volume tourism.
- 2) Support local tourism operators and service providers in the promotion and marketing of the diversity of tourism attractions, including Coelacanth ecology, recreational fishing, diving, wildlife observation and local culture.
- 3) Develop tourism infrastructures in collaboration with tourism operators, where appropriate, to develop public tourism facilities, such as nature trails and mooring buoys, piers, etc.
- 4) Train park staff and selected individuals from local communities to interact with visitors in a professional, courteous and constructive manner.
- 5) Provide guideline for tourism investment in the Park e.g. Investment guidelines, EIA guidelines and other relevant documents.
- 6) Develop a system to record and monitor visitors use of the park.
- 7) Develop a tourism management plan.
- 8) Identify potential cultural and natural tourist's attraction sites in collaboration with local communities and collate information of the relevant sites.
- 9) Develop a land-use plan for TACMP that identifies areas for potential tourism development.
- 10) Develop visitor's management plan (code of conduct) that captures safety regulations for water sports and procedures in the event of an emergency.

5.2.8. Objective: To conserve and protect the cultural heritage of the TACMP

Strategies

- 1) Collaborate with communities and mandated institutions to formulate appropriate management measures to preserve and restore historical and sacred sites.
- 2) Identify cultural sites in collaboration with local communities and collate information of the relevant sites.
- 3) Train staff and key stakeholders on the importance and management requirements of cultural sites and relics.

CHAPTER 6

ZONING SCHEME

RATIONALE

Zoning is the primary management tool of multiple use in marine protected areas. Its aim is to harmonize otherwise conflicting conservation and livelihood objectives by spatially separating extractive resource use areas from sensitive habitats. The zoning of a marine park is an integral part of any management plan that aims to combine multiple activities, some of which are incompatible by their nature. Zoning schemes are developed to accommodate such multiple resource uses, by dividing the park into different areas with different levels of protection and regulation depending on their individual environmental and economic importance. Further guidance on the type of activities permitted in each zone can be found in chapter 7.

6.2. PURPOSE

The aim of the TACMP zoning scheme is:

- to protect critical, sensitive and biodiversity-rich habitats including sub-tidal areas, mangroves, fish spawning, breeding and nursery grounds, and key habitats of endangered species;
- to sustain and replenish populations of key species as a source of food for local communities;
- to safeguard local community fishing grounds and provide a means for their sustained use;
- to provide a clear framework for surveillance and enforcement activities by focusing it on zones that merit higher levels of protection;
- to provide the geographical basis against which resource use is evaluated and the effectiveness of plan implementation is measured;
- to separate incompatible activities and avoid conflict over resources among users;
- to ensure that cultural and aesthetic values of the area are maintained.

6.3. DEFINITION OF ZONE TYPES

Three designated types of zones are suggested for TACMP: Core, Specified Use, and General Use Zones (Fig.5). The Marine Parks and Reserves Act No. 29 of 1994 foresees a Buffer Zone that extends some 800 - 1000m around the outer park boundary. In case of TACMP, the National Mangrove Management Project (MMP) furthermore provides a comprehensive zoning scheme for mangroves, which is the basis for zoning mangroves within the park. The following lists criteria and resource use strategies for each of these zones.

6.3.1. Core Zones

Core Zones represent areas of high conservation value, and therefore provide the highest level of protection within the park where extractive resource use of any sort is relinquished and prohibited. It is therefore, essential that all resource users are aware of, understand the reasons for, and contribute to the designation of each individual Core Zone inside TACMP.

Criteria for Selection

An area is selected for designation as a Core Zone if it qualifies for one or more of the following criteria:

- comparatively pristine or intact condition and representing key types of natural habitat found within the park, including great diversity of habitats;
- relatively high levels of locally representative biodiversity important spawning, breeding or nursery grounds, or otherwise important to productivity and natural replenishment of natural resources in adjacent areas inside or outside the park;
- critical for the survival of rare or threatened species;
- high or presumably high levels of resilience to natural disturbances and climate change;
- special cultural significance;
- a historical area of strict protection through voluntary community closure; (during TCZCDP).

Within Core Zones all biotic and abiotic resources and ecosystem processes are protected from anthropogenic activities and no extractive use is permitted. Each Core Zone proposal was discussed directly with users, to maximize compliance. Controlled tourism, use of culturally important sites and scientific research are permitted. In Tanga coelacanth Marine Park the identified core zones are as indicated in Table 6.1 below;

TABLE 6.1: Core Zones in TACMP

	Core zone	Main habitat type	Area (Hectares)	Total (Hectares)	Description (Rationale for selection)
1	Shenguwe reef	Coral / tidal reef	67.8	177.5	Good coral reefs with abundant commercial fish, invertebrates. Formerly closed area under the CMA scheme during TCZCDP.
2	Makome reef	Coral / tidal reef	109.7		
3	Toten Island	historical site, Island and mangroves	46.1	46.9	Important historical sites, which should be improved as tourist attraction and hence contribute in income generation.
4	Tongoni caves	Historical site	0.8		
5	Karange mangroves	Mangrove	445.8	974.9	Good mangrove cover, good nursery ground for fish and other marine organisms.

6.3.2. Specified Use Zones

Specified Use Zones represent areas which are of high conservation value, but that are also of key importance to local resource users. They therefore permit specified activities and resource use to local residents of the park, while restricting the area from use by non-resident users. Specified Use Zones thus provide a lower level of protection than Core Zones.

Criteria for Selection

An area is selected for designation as Specified Use Zone according to the criteria used for Core Zones (see 6.3.1.):

In **TACMP** the areas identified as specified use zones are as indicated in Table 6.2 below;

TABLE 6.2: Specified Use Zones in TACMP

	Name	Main habitat type	Justification criteria
S1	Upangu	Coral /Tidal reef	Specified Use Zones S1-S9 were selected based on similar criteria: <ul style="list-style-type: none"> - important fishing areas - high importance for sustaining livelihoods, but in need of protection from overfishing and destructive fishing practices; - important spawning, breeding, or nursery grounds for commercial fish and invertebrates; - source of productivity and natural replenishment in adjacent areas; - in need for habitat and ecosystem recovery, e.g. octopus and lobsters fishery is regulated; - a history of strict protection by community through voluntary closure.
S2	Taa	Coral /Tidal reef	
S3	Majivike	Coral /Tidal reef	
S4	Kange	Coral /Tidal reef	
S5	Fungu Tongoni	Coral /Tidal reef	
S6	Jambe	Coral /Tidal reef/ mangrove	
S7	Kipwani	Coral /Tidal reef	
S8	Karange	Coral /Tidal reef / mangrove	
S9	Nyuli	Coral /Tidal reef	
S10	Jambe-Karange	Open sea - up to 200m	

6.3.3. General Use Zones

General Use Zones provide local park residents with opportunities for sustainable resource use and development, thereby relieving resource-use pressure from zones with higher protection. Some General Use Zones play an important role in maintaining ecosystem processes and the overall productivity of the park, e.g. through connectivity with other zones and the broad scales of ocean processes. Generally all activities are allowed for local residents, and outsiders also are allowed to use the zone if they have been issued with the required permits.

Criteria for selection

All areas within the Marine Park boundary not designated above as either core or specified use zones are designated as General Use Zones.

Resource use strategy

Extractive resource use is permitted in General Use Zones, however non-area based restrictions apply to General Use Zones. The objective of regulations in General Use Zones is to ensure that fisheries catches, mangrove harvesting and other resource exploitation is sustainable from year to year, despite natural variations in breeding and recruitment of commercial or otherwise exploited species. Habitat alteration is only acceptable if the overall productivity of the environment is not undermined and if adjacent areas with a higher protection status are not negatively affected or deteriorated in ways defined (in 6.3.3.) above. This entails excluding from General Use Zones methods of resource use likely to damage benthic habitats or otherwise adversely affect the breeding and recruitment of commercial species, as well as methods that remove an unsustainable number of juvenile or adult organisms. It also entails restricting the number of resource users of each type to a sustainable level. TACMP residents have priority access to resources in General Use Zones. Nonetheless, other resource users from outside the park may undertake

certain resource use activities once they hold relevant permits from the marine park and permission from local village councils as appropriate.

6.3.4. Buffer Zone

The Buffer Zone is an area outside and adjacent to the TACMP boundary that safeguards against encroachment of environmental threats from outside the park. It aims to manage processes and activities that may affect ecosystems inside the park.

All new developments and land allocations within the Buffer Zone are usually obliged to undergo the same EIA scrutiny as developments within the marine park boundary, following the official guidelines.

CHAPTER 7

PROHIBITED AND REGULATED ACTIVITIES

This chapter outlines activities that are prohibited within the marine park as a whole or that should be regulated and restricted within a particular zone type. It follows the strategies for use of resources, as defined for each zone type in chapter 6. Subsidiary regulations will be drawn-up to support the regulations set out in this chapter, to support implementation of the General Management Framework, and these will be notified under the Marine Parks & Reserves Act No. 29 of 1994.

7.1. PROHIBITED ACTIVITIES

All activities prohibited under the existing national legislation shall apply across all zones within the park boundaries. In addition, the following activities are prohibited:

7.1.1. Extraction of Living Resources

- Use of drag nets, including those known locally as ‘juya’, ‘kavogo’, ‘juya la kusini’, ‘juya la kojani’, ‘kokoro’, ‘kigumi’ or ‘mtando’.
- Any activity involving mechanical damage to, or breakage of, live corals and other benthic habitats or organisms, whether by hand or by use of poles or other implements.
- Killing of turtles, whale sharks, dolphins and dugongs, whether accidental or deliberate, including removal of turtle eggs.
- Killing of coelacanths, whether accidental or deliberate.
- Trawling, whether deploying bottom or pelagic gear.
- Use of propelled spear-guns and harpoons for fishing.
- Use of dynamite or explosives for any purpose.
- Possession, selling, or stocking of dynamite or any other explosive, and possession or selling of fish or fisheries products killed by explosives.
- Use of chemicals and poisons for fishing, or being in possession of fish or fisheries products killed by poison.
- Use or possession of electric devices to kill fish or fisheries products, or to simplify fishing.
- Use of SCUBA gear to collect any marine organism, with exception of research purposes that have received prior written authorization (specified permit) by the Warden-in-Charge.
- Mangrove cutting without possession of a valid, government-issued license for any purpose, and all mangrove cutting for commercial use or sale.
- Use, possession, selling or stocking of monofilament nets often known as ‘likembe’.
- Frightening, stupefying or stunning fish into a stationary gill net often known as ‘katuli’.
- Fishing for sea cucumber.
- Fishing for octopus during the period between 1st June and 31st August
- Fishing using ring nets during daytime or in shallow waters

7.1.2. Prohibited Extraction of Non-living Resources

- Mining of dead coral from inter-tidal and sub-tidal areas.
- Sand or mud mining, and gravel extraction from beaches, shores and sub-tidal areas, unless permission is explicitly granted in writing by village government for domestic use.
- Any form of seabed mining.
- Hydrocarbon exploration and drilling without explicit issuance of MPRU authorization following formal EIA scrutiny.
- Production of salt by heating water or sea-water using fuel wood, charcoal or other hydrocarbons.

7.1.3. Prohibited Construction and Development

- New developments which involve dredging e.g. port construction and other facility development and/or dredging inside the park are prohibited without explicit issuance of MPRU authorization following formal EIA scrutiny.
- Large-scale processing plants and installations like those used for commercial aquaculture, whether floating or land-based, lime processing and limestone mining, salt works and large agro processing plants are prohibited without explicit issuance of MPRU authorization following formal EIA scrutiny.
- Installation of new heavy industry and other industrial developments are prohibited without explicit issuance of MPRU authorization following formal EIA scrutiny.
- Use, possession and/or selling of dynamite and other explosives for any purpose are prohibited.
- Dumping into marine waters of any solid waste, untreated waste water and sewage and/or chemically polluted water or liquid are prohibited. This includes deposit or discharge of any oil, chemicals, or other hazardous substances in the park or its Buffer Zone.
- Artificial drainage of land area is prohibited.
- Any cultivation, deforestation and/or farming on the offshore islands of Jambe, Karange and Toten Islands is prohibited.
- No land reclamation is allowed without explicit issuance of MPRU authorization following formal EIA scrutiny.

7.1.4. Prohibited Tourism Activities

- Jet skiing
- Sea-planes

7.1.5. Other Prohibited Activities

Transfer, forge or receipt of any permit, license or required certificate by misrepresentation or other illegal means is strictly prohibited and will be prosecuted.

7.2. REGULATED ACTIVITIES

The following are guidelines under which conditions certain activities may be permitted within the marine park. They should form the basis of subsidiary legislations under the Marine Parks & Reserves Act No. 29 of 1994, and supplemented by the Fisheries Act of 2003.

7.2.1. Fishing

- All fishing activities are prohibited in the Core Zones.
- In the Specified Use Zones fishing is restricted to artisanal fishers who are residents of the park.
- In the Specified Use Zones and General Use Zones fishing may be further regulated through specified time and gear restrictions (as below), and depending on resource use trends obtained from analysis of regular fisheries monitoring.
- All residents in the park will be issued with Local Residence User Certificates (LRUCs).
- Resident artisanal fishers will regularly be required to provide information on the type of their fishing vessel(s), gear(s) and other equipment they use.
- Upon recommendation from the respective village councils, visiting fishers will be issued with permits by the Warden-in-Charge.
- It is prohibited to disturb a spawning fish, octopus, or other fisheries resources, and to enter any bed, bank or shallow water in which there is spawning taking place during certain times of the year.
- Restricted access to Specified Use Zones (such as partial closure) during spawning times is possible and will be subject to further regulation.

Invertebrate fisheries

- Lobster/crayfish and octopus fisheries are restricted to artisanal fishers who are residents of the park, but may be subject to size and catch weight limitations (e.g. >10cm mantle length, >500g weight for octopus) and for Lobsters >500g and berried females.
- A fishing license for octopus is required, whereas shore-based collection and skin diving for octopus and lobster is prohibited between 1st June and 31st August of each year.

Sport fishing

- Sport fishing is restricted to designated areas within the marine park (General Use Zones), and requires prior issuance of a sport fishing license from the Fisheries Development Division, and a permit from the respective Marine Park.
- Sport fishing may be subject to minimum and maximum size and weight limitations, and fishers are required to release alive all fish beyond these limits.
- Sport fishers regularly provide catch information and permit information to any duly authorized patrolling or enforcement officer.
- A marine park observer may be posted on sport fishing vessels during fishing activities, subject to justification by the Warden-in-Charge.

Destructive gears

- All gill nets and bottom-dragging set nets, including 'nyavu kuzungusha', 'nyavu kuvuta', and 'tambo' are prohibited from Core Zones and Specified Use Zones but permitted in General Use Zones for licensed local residents. Use of poles and other implements is prohibited. Nets with stretched-mesh size of less than 3 inches will be phased out within the park.

7.2.2 Mangrove Harvesting

Described as sensitive areas under the Forest Act (2002), harvesting of mangrove products, especially tree cutting, should be strictly regulated under a resource use permit and licensing system. In addition, the following is proposed to apply:

- Mangrove harvesting is strictly prohibited in all Core Zones. Harvesting is limited to park residents who have obtained a specified permit (issued for zones other than Core Zones).
- In the Specified and General Use Zones, mangrove harvesting is restricted to local residents of the park for the purpose of boat-building, repair and domestic construction, subject to TACMP-issued licenses. Mangrove harvesting for charcoal and firewood, or in kilns and salt making, is prohibited.
- Permits will specify area for cutting, time of harvesting, quantity, and rules for cutting. Permit issuance may be subject to a limited number of mangroves to be cut; it may require the applicant to plant seedlings; and may establish limits on the species of mangroves that can be harvested.
- Significant clearance felling of mangroves will not be permitted in any zone.
- Collection of dead mangrove branches, fruits, leaves and seeds is allowed outside Core Zones without need of a permit.
- No mangroves shall be harvested any closer than 15m from the edge of any stream that they are bordering, to protect streams from erosion.
- Harvesting mangroves for commercial purposes within the park boundaries is prohibited.
- Non-residents or residents without a valid permit caught harvesting mangroves within park boundaries will be prosecuted to the full extent of the law.
- Harvesting of mangroves in the park area will require permit from the Park Warden following recommendations from the respective village councils.
- Any other use not mentioned here should follow permissions and regulations of the national Mangrove Management Plan.

7.2.3. Harvesting of other Forest Products

Harvesting of non-mangrove products should be subject to a permit system.

- Pole cutting is strictly prohibited in all Core Zones, and in all other Zones is restricted to park residents who have obtained a permit to do so.
- Even where a permit has been issued, the cutting of poles may be subject to replanting appropriate alternatives.

7.2.4. Salt Production

- Salt production using solar energy may be undertaken in General Use Zones, subject to a permit by the park and approval of the location by the relevant Village Council.

7.2.5. Regulated Construction and Development

- An independent Environmental Impact Assessment (EIA), with technical endorsement from NEMC and formal approval from MPRU is mandatory for any new construction or development inside the park area and its buffer zone. Such EIA needs to be conducted and reviewed according to procedures set out in the MPRU guidelines & procedures for investments and for EIA; the NEMC EIA guidelines (1997); and follow principles of sectoral policies for Fisheries (2003), Forestry (1998), Wildlife (1998), Environment (1998), and Land (1995).
- EIA requirements and provisions include, but are not limited to: tourism lodges; mining plants, salt works and commercial outlets for livestock herding and cash crop production; marina development, jetties and mooring installations; mariculture/aquaculture farms and related facilities; new or existing port facilities; permanent docking facilities; small-scale processing plants and installations.
- No land or area inside the park or Buffer Zone can be put into new use without an environmental impact assessment according to the above. Any construction not following and/or approved under these guidelines, even retrospectively, will be required to adjust accordingly.
- Local residents' houses, civic buildings and public amenities are exempted from EIA requirements.
- Any person conducting seaweed farming needs to obtain a license and continuously record harvest information in a log book. Damage or destruction of existing and approved seaweed farms and mariculture facilities, including materials and equipment, is prohibited.

7.2.6. Regulated Tourism Activities

- Special permits will be issued by the Warden-in-Charge for sport-fishing, yatching, anchoring of cruise ship and camping inside the park.
- Any tourism construction requires an Environmental Impact Assessment as set out under regulations for construction and development.

7.2.7. Scientific Research

- All scientific research within the park boundaries is subject to prior issuance of a permit by the Warden-in-Charge, at his/her discretion and subject to justification. A scientific permit allows for the limited collection of specimens for scientific reasons, but not for hydrocarbon prospecting purposes.
- Different types of fee and rates will be charged to national/resident and foreign scientists conducting research inside the park. Fees may be waived if the Warden-in-Charge deems the planned research to be in the interest of the marine park.
- The preliminary results from scientific research carried out in the park shall be forwarded to the Park management in an easily understandable format, and ideally including maps. Publications based on scientific research carried out in the park should be communicated back to the Park when they become available, for purpose of the park's information management.

7.3. SUMMARY OF PERMITTED AND REGULATED USES

Summary of Tourism and Research Regulations by Zone

Activity	Core Zone	Specified Use Zone	General Use Zone
SCUBA diving	P	P	P
Swimming & snorkeling	Allowed	Allowed	Allowed
Windsurfing, sailing	Allowed	Allowed	Allowed
Construction	X	P	P
Sport-fishing (as above)	X	X	P
Overnight boat-mooring	X	X	P
Camping	P	P	P
Research	P	P	P
KEY	X = Not permitted P = TACMP or village permit required		

Summary of Permitted Fisheries Activities by Zone

Activity	Core Zone	Specified Use Zone		General Use Zone	
	All Users	Residents	Others	Residents	Others
Handlines, box-traps, fence traps	X	LRUC	X	LRUC	P
Longlines	X	LRUC	X	LRUC	P
Pull nets (>3" mesh size)	X	X	X	X	X
Set-nets, shark nets (3-7" mesh size)	X	P	X	LRUC	P
Shark nets (>7" mesh size)	X	X	X	LRUC	P
Sport-fishing	X	X	X	LRUC	P
Octopus collection	X	LRUC (X for 1/06-31/08)	X	LRUC (X for 1/06-31/08)	P (X for 1/06-31/08)
Lobster collection	X	LRUC (X for 30 th June -31 st August)	X	LRUC (X for 30 th June -31 st August)	P (X for 30 th June -31 st August)
Ring net fishing during day time	X	X	X	X	X
Crab, shells (for food)	X	LRUC	X	LRUC	P

Activity	Core Zone	Specified Use Zone		General Use Zone	
	All Users	Residents	Others	Residents	Others
Shells collection for curio trade	X	X	X	LRUC X	X
Aquarium collection	X	X	X	X	X
Animal-based mariculture	X	P	X	LRUC	P
Other marine bio-prospecting	X	X	X	P	P
KEY	X = Not permitted LRUC = Local resident user certificate required P = Park permit required				

Summary of Permitted Marine Resource Use (non-fishing) by Zone

Activity	Core Zone / Zone I for mangrove	Specified Use Zone/ Zone II for mangroves		General Use Zone / Zone IV for mangroves	
	All Users	Residents	Others	All Users	Residents
Mangrove cutting (subsistence, domestic material & boat- building)	X	X	X	LRUC/P*	X
Collection of other mangrove resources (dead fallen wood, seeds, fruits)	X	LRUC	X	LRUC	X
Seaweed / seagrass collection	X	P	X	LRUC	P
Seaweed farming	X	P	X	LRUC	P
Salt production	X	X	X	P	X
KEY	X = Not permitted LRUC = Local resident user certificate required P = Park permit required				
	* adjust according to provisions set forth in National Mangrove Management Plan.				

Summary of Permitted Forest and Terrestrial Resource Use by Zone

Activity	Core Zone	Specified Use Zone		General Use Zone	
	All Users	Residents	Others	Residents	Others
Pole-cutting (non-mangrove)	X	P	X	LRUC	X
Cutting of reserved treed for timber	X	X	X	P	X
Medicinal plants, firewood (non-mangrove), raffia fibre collection	X	P	X	LRUC	X
Agriculture & Agro-forestry	X	X	X	LRUC	X
Beekeeping	X	P	X	LRUC	X
Hunting	X	X	X	LRUC	X
Land-based fossil coral mining	X	X	X	LRUC	X
Construction	X	X	X	LRUC	P
Camping (fishermen)	X	P	P	LRUC	P
KEY	LRUC = Local resident user certificate required X = Not permitted P = TACMP permit required				

CHAPTER 8

MANAGEMENT STRUCTURE AND OPERATIONAL FRAMEWORK

In accordance with Marine Parks and Reserves Act No. 29 of 1994, the Board of Trustees, through the Marine Parks and Reserve Unit (MPRU), is responsible for the management of Tanga Coelacanth Marine Park (TACMP). Day to day operations of the Park are the responsibility of the Warden-in-Charge, supported by a team of professionals and support staff in the field. Building on Tanga's remarkable experience from TCZCDP in the collaborative management for coastal resources at village and District level, guidance is furthermore sought from long-standing Collaborative Management Area Plans (CMAPs), which form the cornerstone of area-based management within the park.

8.1. MANAGEMENT STRUCTURE, ROLES AND RESPONSIBILITIES

8.1.1. The Board of Trustees and the Marine Parks and Reserve Unit

The Board of Trustees formulates policies on all marine parks in Tanzania, and directs the MPRU on all matters regarding the designation and management of the marine parks system. Part II of Act No. 29 of 1994 (hereinafter referred to as 'the Act') establishes MPRU, whose functions include:

- to seek funds for the establishment and development of marine parks and reserves, and
- to implement and enforce the provisions of the Act and any subsidiary legislation pursuant to its Sections 18 to 38.

8.1.2. The TACMP Advisory Committee

The purpose and composition of the TACMP Advisory Committee is provided in the Part II of the Act. The Advisory Committee is established to advise the Board of Trustees; consult with the Warden-in-Charge on technical, scientific and operational matters and to propose names to the Board of Trustees for the purpose of appointing a Warden-in-Charge. The Advisory Committee constitutes a representative forum of TACMP stakeholders, including local communities, Regional and District Government, a non-governmental organization, a research institution and representatives of the local tourism and fish processing investors within the park area. The Committee meets quarterly and submits its regulations directly to the Board of Trustees. The Warden-in-Charge serves as Secretary to the Advisory Committee.

8.1.3. The Warden-in-Charge

The Warden-in-Charge is responsible for all matters concerning the park administration and is subject to the control of the Board of Trustees and the Advisory Committee. The Warden has a particular responsibility to local communities and resource users, District Authorities and other stakeholders, including that of timely notifying all concerned users and other stakeholders of planning efforts, decisions and changes, as well as ensuring that they all have ample opportunity to participate in, and provide feedback on, the management and operations of the park.

8.1.4. Village Liaison Committees

Part V of the Act provides that each Village Council which *“affects or is affected by the marine park, either directly or through a designated committee shall participate fully in all aspects of the development of regulations, zoning and the general management plan.”* The designated structure for village-level liaison with the park is the 19 elected Village Liaison Committees (VLCs). Each VLC is comprised of representatives who are elected by associations of fishers and other members of the community, to serve as the primary interface with the marine park on behalf of their community and the Village Council. A critical role of VLCs is therefore to ascertain routine communication and a continuous information flow both from villagers to the park and from the park management to the village assemblies (i.e., a shared management responsibility between the park and the VLCs, as per Subsections 8.6 and 8.7 of the Act). Other activities of the VLCs include awareness raising within the community; coordination of joint patrols and other activities implemented in close collaboration with District and park staff; encouraging compliance with park regulations; and evaluation and progress reporting on all village-level park matters.

8.1.5. Guiding Role of Village-level Collaborative Management Arrangements and the CMA Plans

Two Collaborative Management Area Plans (CMAPs) have previously been established by villages and District Councils within today's TACMP area. They are principally operational since 2000 and cover the villages of: Kigombe, Mwarongo, Geza, Meare, and Muheza District Council in the *Mtang'ata CMA Plan*; and Mwarongo, Geza, Tongoni, Maere, Machui, Mchukuuni, Mwambani, Ndumi, Kiungani, Sahare and Tanga Municipal Council: *Mwarongo-Sahare CMA Plan*.

Both CMAPs are in line with the provisions of the TACMP GMP and are compatible with one another (e.g., some villages are involved in both plans). In many ways, the format of each CMAP follows that of the GMP, and their close consideration helps to ensure that the villages become the on-the-ground implementers of the GMP. Each CMAP contains the following:

- a brief introduction explaining the plan, geographical coordinates and a list of stakeholders;
- the management principles to be used;
- the responsibilities of each stakeholder group for plan implementation;
- steps and consultative process used in formulating the plan;
- a summary matrix on the purpose, expected results, indicators and assumptions of the plan;
- management actions to achieve the desired results, timeline and task distribution;
- monitoring plan and arrangements; and
- declaration of voluntary closure of reefs, regulations and sanctions.

Guidance from the CMAPs, therefore, provides the basis upon which the park is managed, with shared management implementation between villagers, Districts and Central Government on key tasks such as enforcement. Such an approach ensures that the local communities are truly and meaningfully involved in the management of the park, as required by the MPRU Act and recommended across key sectoral policies such as the fisheries and forestry policies.

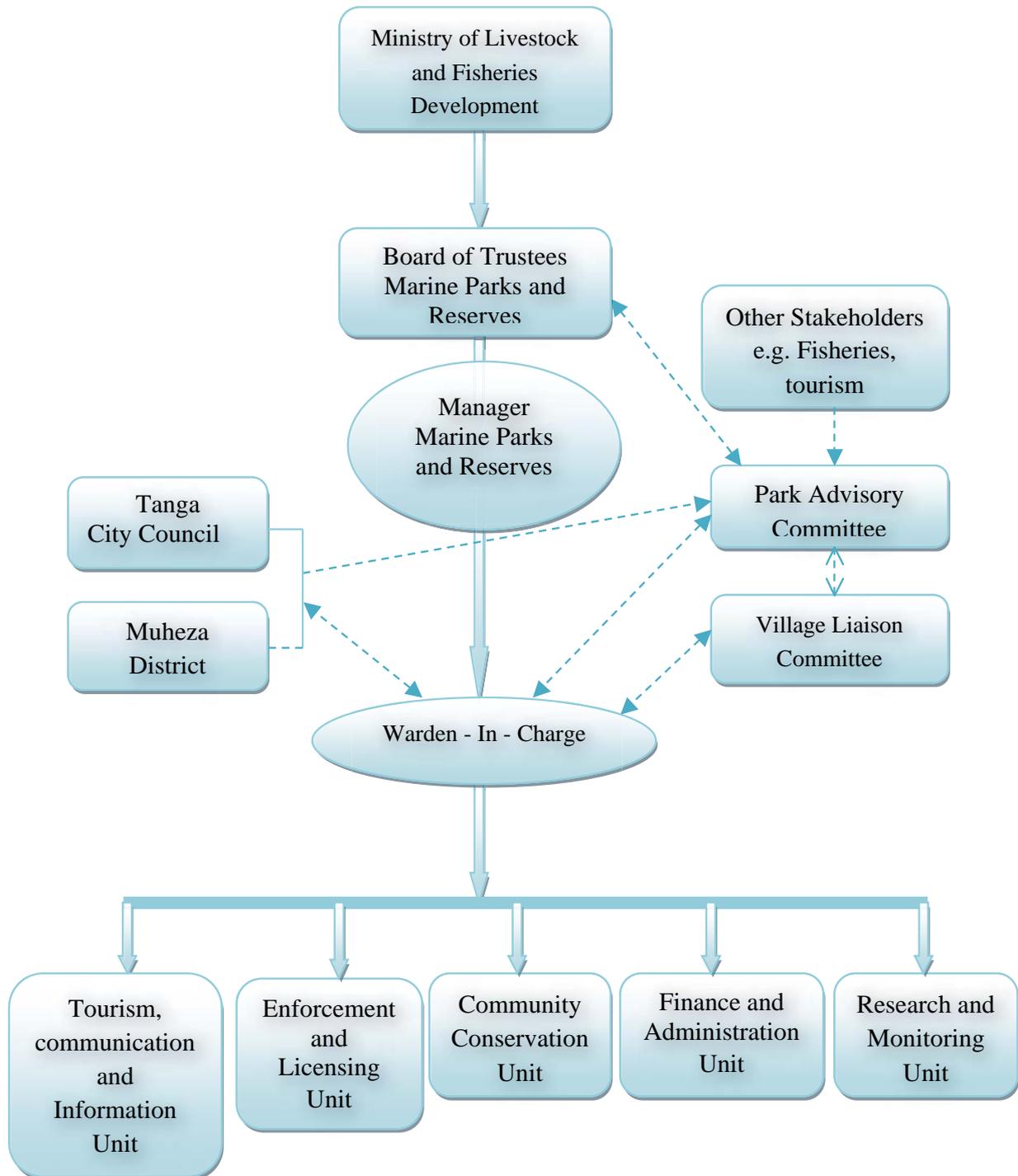
8.1.6. Tanga and Muheza District Councils

Tanga Coelacanth Marine Park is the first marine park in Tanzania that straddles administrative district boundaries. This situation provides new opportunities, such as a strengthened voice for the acquisition of financial support to its management. At the same time, it makes effective coordination between the two Districts and the Park management essential for GMP implementation. A number of important management issues require active collaboration between the authorities of Tanga City and Muheza Districts, including, *inter alia*:

- EIA requirements for developments in the Buffer Zone / outside the park boundary;
- the issuance of licenses (e.g. fishing, mangrove harvest) and collaborative patrolling;
- the collection of levies, license fees and user fees within TACMP and the sharing/disbursement of revenues; and
- issues relating to land title and concession fees within the park boundary.

The marine park will seek to develop an appropriate, formal and mutually acceptable agreement with the District Councils, while building on existing collaborative activities such as on ecological monitoring and data collection. It will furthermore actively promote the development of formal agreements (Memoranda of Understanding) between both Districts for practical arrangements such as respective District staff working throughout the park on collaborative law enforcement; procedures for park financing and revenue collection; and common positions and prosecution of illegal activities. Regular coordination meetings involving the two District Councils and facilitated by the Regional Administration, are proposed to quickly progress on these practical arrangements.

Management Structure of Tanga Coelacanth Marine Park



8.2. SUBSIDIARY LEGISLATION

Effective enforcement of the GMP requires the preparation of subsidiary regulations and financial arrangements. Those regulations shall cover, *inter alia*, the following:

- the Zoning Plan
- supplementary legislation on specific resource-use restrictions
- qualifications for TACMP residency status and criteria for the issuance of user fees
- detailed legal provisions for permit and licensing schemes
- financial arrangements for revenue-sharing and the collection of levies, staged license/permit fees
- user fees and concession fees
- mariculture development guidelines
- Tourism Investment Framework
- EIA and Investment guidelines

All these implementing regulations are collectively referred to as the General Regulations for the Tanga Coelacanth Marine Park. Sections 7, 13, 16, 18, 19, 20, and 23 of the MPRU Act will guide their preparation. The Warden-in-Charge and TACMP field staff will initiate the process of preparing draft regulations under the guidance of MPRU in consultation with local stakeholders. A preliminary agreed draft will be submitted to the Marine Park Advisory Committee.

Following the Committee's modification the proposed drafts will then be submitted to MPRU for professionally legal drafting and subsequent submission to the Board of Trustees for further input and approval. The Board will then recommend proposed regulations to the Minister for adoption and gazettment.

CHAPTER 9

MONITORING, EVALUATION AND REVIEW OF THE GMP

9.1. WHY MONITOR MANAGEMENT EFFECTIVENESS

The long-term success of a marine park depends on effective management and community participation, combined with an accountable demonstration of its usefulness as a resource conservation and management tool to government agencies, donors and the public (Mangubhai and Wells, 2005). Assessing management effectiveness in TACMP means regularly measuring the degree to which all 8 management objectives of the park are being achieved, by using biophysical, socio-economic, cultural and management/governance parameters. The monitoring thereby provides feedback on how successfully the park is designed, planned and managed. It can also help to identify emerging threats and needs of the park (both issues that are within the control of the manager and those that go beyond it) and provide important lessons learned so that adjustments can be made as needed.

The TACMP GMP relies on adaptive management as a key guiding principle, where assessments will be carried out to establish TACMP successes and to translate any shortcomings into improvements that generate positive change. The sharing of knowledge, skills and experiences in the planned participatory assessments with stakeholders furthermore helps people understand why management measures and practices are implemented the way they are.

9.2. HOW TO ASSESS MANAGEMENT EFFECTIVENESS FOR TACMP

In order to assess the effectiveness of the park, it is necessary to track changes in biophysical, socio-economic and governance environment, and this is usually done by using a combination of change indicators for measuring trends. Depending on the selected methodology, a set of indicators can include, for example, habitat distribution and complexity (biophysical), perception of local resource harvest (socio-economic), or the degree of interaction between managers and stakeholders in collaborative enforcement, gender monitoring etc. (Pomeroy *et al.* 2004).

9.3. PERIODIC REVIEW OF THIS PLAN

This GMP is not a static document and will be reviewed at least after every ten years with midterm review of 5 years to reflect resource use trends. New information acquired through more comprehensive research and monitoring, and possible attitude and perceptions changes of the local community and resource users during the course of implementation of this GMP. The review will also be conducted in an open, transparent and consultative manner to incorporate the views and concern of resource users.

BIBLIOGRAPHY

- Anderson J (2004) Analysis of reef fisheries under co-management in Tanga. IUCN Eastern Africa Regional Programme, Nairobi, Kenya. 51 pages.
- Bensted-Smith R (ed) (1988) The coastal resources of Tanga Region, Tanzania. Report of a preliminary study in October 1987. Regional Natural Resources Office, Tanga Region and IUCN-EARO. 51 pages.
- Buriyo AS, Shayo S, Dlaza TS, Mhitu H & Mmonwa AL. In review. Diversity of Macro-algae in the proposed marine protected area at Kigombe, Tanga, Tanzania. ACEP informal report to MPRU. 9 pages.
- Burke L, Reytar K, Spalding M & Perry A (2011) Reefs at risk revisited. World Resources Institute, Washington DC, USA. 130 pages.
- Emerton L & Tessema Y (2001) Economic constraints to the management of marine protected areas: the case of Kisite Marine National Park and Mpunguti Marine National Reserve, Kenya. IUCN, Nairobi, Kenya. 26 pages.
- Gorman M (1995) Socio-Economic Study / Participatory rural appraisal conducted in March & April 1995. Report to Tanga Coastal Zone Conservation and Development Programme. 66 pages.
- Guard M & Masaiganah M (1997) Dynamite fishing in Southern Tanzania: geographical variation, intensity of use and possible solutions. *Marine Pollution Bulletin* 34(10): 758-762.
- Harrison P (2005) A Socio-economic assessment of sustainable livelihoods regimes for communities of Mnazi Bay Ruvuma Estuary Marine Park, Tanzania: incorporating livelihood intervention strategies and proposals for the development of alternative income generating activities. IUCN EARO, Nairobi.
- Harrison P (2010) Entrenching livelihoods enhancement and diversification into Marine Protected Area management planning in Tanga, Tanzania. IUCN ESARO, Nairobi, Kenya. 95 pages.
- Horrill C & Makoloweka S (1998) Silencing dynamite fishing along the Tanga Coast, Tanzania. Session 7: destructive fishing practices and collecting methods. ITMEMS symposium proceedings, 1998: 260-266.
- Horrill JC (1999) Coral reefs of Tanga Region. Report of Coral Reef Survey. Tanga Coastal Zone Conservation and Development Programme. 30 pages.
- Horrill C, Kamukuru YD, Mgaya Y & Risk M (2000) Northern Tanzania, Zanzibar and Pemba. In: McClanahan TR & Obura DO (eds) *Coral reefs of the Indian Ocean: their ecology and conservation*: 167-198. Oxford University Press, New York.
- Horrill C, Kalombo H & Makoloweka S (2001) Collaborative reef and reef fisheries management in Tanga, Tanzania. IUCN EARO, Nairobi, Kenya. 37 pages.
- Ireland C, Malleret D & Baker L (2004) Alternative sustainable livelihoods for coastal communities. A review of experience and guide to best practice. IUCN EARO, Nairobi, Kenya. 48 pages.
- IUCN (1987) The Coastal Resources of Tanga Region Tanzania: report of the preliminary study of the status and utilization of Tanga's coastal natural resources, with management recommendations. IUCN EARO, Nairobi, Kenya. 37 pages.
- IUCN (2004) Managing marine protected areas: a toolkit for the Western Indian Ocean. IUCN EARO, Nairobi, Kenya. 172 pages.
- Kaehler S, Ribbink A & Scott L (2008) ACEP Final Report 2007/8: Nearshore and offshore studies in the Western Indian Ocean. Final scientific cruise report, African Coelacanth Ecosystem Programme. Grahamstown, South Africa. 290 pages.

- León Y, Tobey J, Torell E, Mwaipopo R, Mkenda A, Ngazy Z & Mbarouk F (2004) MPAs and poverty alleviation: an empirical study of 24 coastal villages on mainland Tanzania and Zanzibar. The World Bank, Washington DC, USA.
- Makoloweka S & Shurcliff K (1997) Coastal management in Tanga, Tanzania: a decentralized, community-based approach. *Ocean and Coastal Management* 37: 349-357.
- Martin KD (2011) Tanga Coelacanth Marine Park participatory management planning: progress and perceptions from the 1st round of stakeholder consultations. Stakeholder workshops with communities and other interest groups in Tanga, Tanzania. 24-25 November 2010. 24 pages.
- McClanahan TR, Muthiga NA, Kamukuru AT, Machano H & Kiambo RW (1999) The effects of marine parks and fishing on coral reefs of northern Tanzania. *Biological Conservation* 89: 161-182.
- McClanahan T.R, Verheij E & Maina J (2006) Comparing the management effectiveness of a marine park and a multiple-use collaborative fisheries management area in East Africa. *Aquatic Conservation: Marine and Freshwater Ecosystems* 16: 147-165.
- Muhando CA (1999) Assessment of the extent of coral damage, socio-economics effects mitigation and recovery of coral reefs in Tanzania. In: Linden O & Sporrang N (eds) *Coral reef degradation in the Indian Ocean: status report and project presentation*: 43-47. CORDIO, Stockholm, Sweden.
- Muhando CA & Mohammed SM (2002) Coral reef benthos and fisheries in Tanzania before and after the 1998 coral bleaching and mortality event. *Western Indian Ocean Journal of Marine Science* 1: 43-52.
- Munro JL & Williams DM (1985) Assessment and management of coral reef fisheries: biological, environmental and socio-economic aspects. In: Gabrie C & Salvat B (eds) *Proceedings of the 5th International Coral Reef Congress* 4: 545-578.
- Nzali LM, Johnstone RW, Mgaya YD (1998) Factors affecting scleractinian coral recruitment on a nearshore reef in Tanzania. *Ambio* 27: 717-722.
- Oliveira EC, Oesterlund K & Mtolera MSP (2005) *Marine plants of Tanzania, a field guide to the seaweeds and seagrasses*. The Botany Department, Stockholm University, Sweden. 267 pages.
- Othina A & Samoilys M (2005) *Impacts of management on coral reefs in Tanga*. IUCN-EARO, Nairobi, Kenya. 38 pages + appendices.
- Pabari M, Matiru V, Muniu H & Thande G (2005) *Building capacity for the use of monitoring and assessment in adaptive management: review of existing systems and practices in Tanga*. Tanga Coastal Zone Conservation and Development Programme. IUCN EARO, Nairobi, Kenya. 33 pages.
- Pabari M, Samoilys M, Muniu H, Othina A, Thande G, Mijifha P & Matiru V (2005) *Using monitoring and assessment for adaptive management: a guide to the TCZCDP information management system*. Tanga Coastal Zone Conservation and Development Programme. IUCN EARO, Nairobi, Kenya. 100 pages.
- Pomeroy RS, Parks JE & Watson LM (2004) *How is your MPA Doing? A guidebook of natural and social indicators for evaluating Marine Protected Area management effectiveness*. IUCN, Gland, Switzerland and Cambridge, UK. 216 pages.
- Ray GC (1968) *Marine Parks of Tanzania*. Conservation Foundation, Washington DC.
- Ribbink AJ & Roberts M (2006) African Coelacanth Ecosystem Programme: An overview of the conference contributions. *South African Journal of Science* 102; 409- 415.
- Ruitenbeek J, Hewawasam I & Ngoile M (2004) *Blueprint 2050 Sustaining the marine environment in mainland Tanzania and Zanzibar*. The World Bank, Washington D.C., USA. 125 pages.

- Salafsky N, Mrgolius R & Redford K (2002) Adaptive Management: a tool for conservation practitioners. Washington DC Biodiversity Support Programme.
- Samoilys MA & Kanyange NW (2008) Natural resource dependence, livelihoods and development: perceptions from Tanga, Tanzania. IUCN ESARO, Nairobi, Kenya. 29 pages.
- Semesi AK (1991) Management plan for the mangrove ecosystem of mainland Tanzania. Forestry and Beekeeping Division, Ministry of Tourism, Natural Resources and Environment, Dar es Salaam, Tanzania.
- Spalding MD, Ravilious C & Green EP (2001) World Atlas of coral reefs. UNEP World Conservation Monitoring Centre, Cambridge, UK. University of California Press, Berkeley, USA. 428 pages.
- Tanzania Coastal Management Partnership (2002) Guidelines for District ICM Action Planning. Core Working Group/NEMC/URI/CRC. 39 pages.
- TATONA (2010) Tanga - Tanzania's secret in-between the ocean & the parks. Tourism Guide for the Tanga Region, Tanzania. 98 pages.
- UNEP (2001) Eastern Africa Coastal Resource Atlas (EAF/14): Tanzania. UNEP/ODINAFRICA, African Marine Atlas. Nairobi, Kenya. 117 pages.
- UNESCO-IOC (2009) African Oceans and Coasts. IOC Information document no. 1255, UNESCO Regional Bureau for Science and Technology in Africa, Nairobi, Kenya. 162 pages.
- URT, the United Republic of Tanzania National Bureau of Statistics and Tanga Regional Commissioner's Office (2008) Tanga regional socio-economic profile. Dar es Salaam, 140 pages.
- URT, the United Republic of Tanzania Ministry of Natural Resources and Tourism (2005) General Management Plan for Mnazi Bay Ruvuma Estuary Marine Park. 58 pages.
- URT, the United Republic of Tanzania Vice President's Office Dar es Salaam (1994) Act No. 29 for Marine Parks and Reserves. 29 pages.
- URT, the United Republic of Tanzania Fisheries Division (1997) National Fisheries Sector Policy and Strategy Statement, Ministry of Natural Resources and Tourism. 13 pages.
- URT, the United Republic of Tanzania Fisheries Division (2003) Fisheries Act 2003 and Regulations of 1989. Government Printers, Dar es Salaam, Tanzania. 42 pages.
- URT, the United Republic of Tanzania, the Vice President's Office (2003) National Integrated Coastal Environment Management Strategy. Tanzania Coastal Management Partnership, NEMC.
- URT, the United Republic of Tanzania Forest Division (2002) Forest Act. Government Printers, Dar es Salaam, Tanzania. 127 pages.
- URT, the United Republic of Tanzania, Vice President's Office (1997) National Environmental Management Council Guidelines & Procedures for Environmental Impact Assessment. Government Printers, Dar es Salaam, Tanzania. 119 pages.
- URT, the United Republic of Tanzania Ministry of Natural Resources and Tourism (2001) Guidelines & procedures for undertaking Environmental Impact Assessments in Marine Parks and Reserves in Tanzania. 53 pages.
- URT, the United Republic of Tanzania Ministry of Natural Resources and Tourism (2006) Guidelines & procedures development of investments in Marine Parks, Reserves and small islands. 24 pages.
- URT, Regional Administration and Local Government Muheza District Council (2009) Integrated Coastal Management Action Plan for Muheza District. 33 pages.

- URT, Regional Administration and Local Government Muheza District Council (1996) A reef fisheries action plan for Mtang'ata management area, 1996-2004. 14 pages.
- Verheij E, Makoloweka S & Kalombo H (2004) Collaborative coastal management improves coral reefs and fisheries in Tanga, Tanzania. *Ocean & Coastal Management* 47: 309-320.
- Verheij E & Kalombo H (2004) Assessing the impact of a community-based network of marine protected areas through long term monitoring of coral reef resources. *Proceedings of 10th International Coral Reef Symposium, Okinawa, Japan*: 1396-1404.
- Wells S & Mangubhai S (2005) Assessing management effectiveness of Marine Protected Areas: a workbook for the Western Indian Ocean. IUCN EARO, Nairobi, Kenya. 60 pages.
- Wells S, Samoily M, Anderson J, Kalombo H & Makoloweka S (2006) Collaborative fisheries management in Tanga, Northern Tanzania. Chapter 7 in: McClanahan TR & Castilla JC (eds) *Fisheries management: progress towards sustainability*. Blackwell Science: 139-165.
- Wells S, Makoloweka S & Samoily M (eds.) (2007) *Putting adaptive management into practice: collaborative coastal management in Tanga, Northern Tanzania*. IUCN EARO, Nairobi, Kenya. 197 pages.
- Wells S, Samoily M, Makoloweka S & Kalombo H (2010) Lessons learnt from a collaborative management programme in coastal Tanzania. *Ocean & Coastal Management* 53: 161–168.



**Board Of Trustees
Marine Parks And Reserves Unit**

September 2011