INDIGENOUS KNOWLEDGE AND ITS APPLICATION TO THE CONSERVATION OF MENAI BAY CONSERVATION AREA IN UNGUJA ISLAND, ZANZIBAR.

BY

RAMLA TALIB OMAR

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN RURAL DEVELOPMENT OF SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

2011

ABSTRACT

This study was focused on exploring the existing indigenous knowledge of various biodiversity conservation in Menai Bay Conservation Area (MBCA). The extent and useful indigenous practices in biodiversity conservation in MBCA efforts were investigated and formal and informal traditional institutions for conservation and management of natural resources were investigated. A survey was conducted in 4 villages using structured questionnaires to capture information on household characteristics. In conducting the survey it was originally planned to interview 30 fishermen per village, a number that would have summed to a sample of 120 fishermen in the 4 villages. Participants in this case study were representatives of the community, including the elderly, the youth, local leaders (*Shehas*) and MBCA Manager. The study was aimed at revealing whether indigenous knowledge is useful for biodiversity conservation and promotes sustainable practices. It examined whether the inherited indigenous knowledge is essential for crafting fishing gears and indigenous practices are consistent with sustainable practices and marine use. Marine knowledge is found to be useful in identifying and locating resources and that sustainable practices ensured continuity of these resources. The findings also revealed formal and informal tradition institutions were useful. However the indigenous knowledge was not documented. Institutions or existing laws for the documentation and dissemination of local indigenous knowledge and practices rarely exist, despite the fact that the collection and dissemination of link is essential for the conservation of the environment and for the preservation of the culture of people associated with sustainable resource management. Although information related to linkage between indigenous knowledge and practices were collected by

different Government agencies and NGOs the information was not well documented and disseminated.

DECLARATION

I, Ramla Talib Omar, do hereby declare to the Senate of Sokoine University of Agriculture, that this dissertation is my original work and that it has neither been submitted nor being concurrently submitted for degree award in any other institution.

10/1/2012

Ramla Talib Omar **Date**

(MARD Candidate)

The above declaration confirmed

Dr. Mbwambo J.S **Date**

(Supervisor)

COPYRIGHT

ACKNOWLEDGEMENTS

The work of this nature could have not been possible without a considerable support from a number of institutions and individuals and it is my pleasure to acknowledge their support. Before that I would rather thank God, the Almighty, who is the source of every thing. The second one is my Husband for giving me both financial and moral supports. Sincere appreciation should as well go to Petter Shunula who works to the Ministry of Livestock and Fisheries Zanzibar, he deserves a thumb up for serving the source of various literatures referred to in this work, and my fellow colleagues in the Department of Development Studies Institute (D.S.I) for all I say thanks on their constructive advice.

Indeed the technical and professional set up of this dissertation could not have been possible without a considerable support from my supervisor Dr J.S. Mbwambo of Development Study Institute. Finally, I deem highly to express my profound and cordial gratitude and gather my human passion and feelings to offer thanks to Professor Ali Aboud for offering me a chance of staying with his family during the month of Ramadhan while I am writing my dissertation.

To all I say:

"THANK YOU".

DEDICATION

This work is dedicated to my Parents Mr. Talib Omar and Mrs Fresh Suleiman who had laid the foundation to my education.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICE

LIST OF ABBREVIATIONS

C N R	Community Natural Resources Conservation
CBD	Convention on Biological Diversity
DFMR	Department of Fisheries and Marine Resources
EAFRO	East African Fisheries Research Organization
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
FRA	Forest Resources Assessment
GOZ	Government of Zimbabwe
IK	Indigenous Knowledge
ILO	International Labour Organization
IPR	Intellectual property rights
IUCN	International Union for Conservation of Nature
MACEMP	Marine and Coastal Environmental Management Project
MANREC	Ministry of agriculture, Natural Resources, Environmental and Cooperative
MBCA	Menai Bay Conservation Area
MDGs	Millennium Development Goal
MNP	Marine National Park
MNRT	Ministry of Natural Resources and Tourism
MPAs	Marine Protected Areas
MPRU	Marine Parks and Reserves Unit
NEP	National environment Policies
NGO	None- Governmental Organization

PECCA	Pemba Channel Conservation Area
PRA	Participatory Rural Appraisal
SANREM	Sustainable Agriculture and Natural Resource Management
TANAPA	Tanzania National Parks Authority
TK	Traditional Knowledge
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
VCCs	Village Conservation Committees
WIOMSA	Western Indian Ocean Marine Science Association
WWF	World Wide fund for Nature
Z RG	Zanzibar Revolutionary Government

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

As per IUCN definition a protected area is a geographical locality on land or sea especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources. Managed through legal or other effective means (IUCN, 2004). At national level protected areas are gazetted and managed by laws and regulations. The form of protection may vary from complete exclusion to community based management that allows local residents to exercise some degree of use of the natural endowments (Fisher, 1993). At the international level, protected areas are supported by a number of programs, conventions and declarations. Usually the international conventions only require the relevant authorities to exercise measures of control that answer to the requirements of all the signatories to the convention. At local levels areas may be protected through norms and customs for purposes that may range from biodiversity conservation to issues related to rituals and customs. Such protected areas are usually designated by local community and sustained through customary laws. There are varying degrees of control measures related to local protected areas. How, why and what is being protected are some of the issues explored in this study.

The Tanzanian government began to designate a few small marine reserves off the coast of Dar es Salaam in 1975 (MANREC, 2005a). However, these were mainly 'paper parks' that remained in papers until 1994 following ratification of the Marine Parks and Reserves Act. Since then, marine protected areas expanded rapidly to

include Misali, a small island of a unique significance off the coast of Pemba Island. It is an island which the Zanzibar government called "the Sacred Gift for a Living Planet". Misali island was declared a protected area by the Zanzibar Government after a tug-of-war with the indigenous people of the island who protested against the move that seemingly would have denied them of the role of protecting their sacred sites on the island (Levine, 2004). Menai Bay, Chumbe and Mnemba islands are the most recently declared protected areas in Zanzibar. Of the last three sites, the Menai Bay protected area is the most contested as it is populated with communities whose livelihoods have long been established around the area. On mainland Tanzania recently declared protected marine areas include Bagamoyo, Mbudya, Fundu Yasini, Maziwi, Pandavini Coral Park and Mafia (Spauling as cited by MANREC, 2005a).

Both on the Mainland and in Zanzibar, declarations of protected areas have often elicited some degree of resentment from the local communities. To some extent this resentment is justifiable as many of the laws and rules governing the protected do not take on board some of the existing indigenous practices. For example at Menai Bay Conservation Area (MBCA) covering approximately 470 km square in the south-western side of Zanzibar Island) government authorities imposed restrictions on the use of certain destructive fishing techniques e.g. beach seine nets, spear guns, explosives, poisons and polluting activities. However, experience has shown that implementation of these restrictions is very limited, with several occasions where the locals find themselves in direct conflict with the govt authorities. The (WWF, 2001) observes that effective and sustainable biodiversity conservation

requires encouragement of traditional institutions and development of local practices that are consistent with biodiversity conservation. In other words engagement of indigenous knowledge abreast with a broad framework of conservation is probably the best approach towards conservation. However, one needs to identify those elements of indigenous knowledge relevant to conservation, the structure or form of the institutions (formal and informal) governing them and the principal players who ensure that rules are followed.

Indigenous knowledge is defined by Kajembe (1994) as cited by Mbwambo (2000) as the "sum of experiences and knowledge of given ethnic group that forms the basis for decision making in the face of familiar problem". Informal Institutions are stable, valued, recurring patterns of behaviour and include asset of rules and procedures that govern some activities of individuals within a group and that shape how people act. It constraints are socially transmitted information and are a part of the culture (Hassan, 2000).

North, (1994) refers to social taboos as examples of informal institutions. Taboos have largely been neglected in formally institutionalized biodiversity conservation strategies. Despite the numerous examples of the utility of the indigenous knowledge and informal Institutions in community based initiatives for conservation (Mbwambo, 2000) there is an amazing paucity of information regarding their use in many parts of the world. In Tanzania the use of indigenous knowledge and institutions is prominent in the terrestrial ecosystems but not on marine resources. It is imperative that a study be conducted to document on the existence, extent of use

and form of informal institutions through which indigenous knowledge is practice in conservation of marine resources. This study limits its observations in Zanzibar at MBCA.

1.2 Statement of the Problem

Local communities have for ages developed and maintained indigenous knowledge (IK) and practices for the management and conservation of biological resources (Kamara, 1994). The indigenous knowledge and practices exist and are used by the people but not fully by the government. The government's reluctance to streamline indigenous practices into the formal regulatory tenets arises partly from lack of empirical evidence of their values. Thus IK and practices have remained in the informal sector, usually preserved in oral traditions and cultural rituals. In the face of rapid cultural changes and globalization many unwritten traditional practices are either lost or modified to an extent that diminishes their significance in biodiversity conservation. Several authors (Mbwambo, 2000) have acknowledged the practical value of IK as an entry point for participatory conservation of terrestrial ecosystems. However, little has been reported on the value of IK in the conservation of marine biodiversity. It is also known that IK and practices are cultural specific and may not be directly transferable from one community to the next. It is therefore important that empirical studies are made to evaluate the practical value of IK and practices for each specific ecosystem, hence the need for this study at Menai bay conservation Area.

1.3 Justification of the Study

Menai bay is currently classed as the hotspot of new investments in the tourism industry of Zanzibar. The entire coastal stripped is being rapidly inundated with construction of beach hotels. This massive change has brought with it widespread changes in the cultural practices of the local communities. Most prominent of these are changes noted in fishing practices as well as traditional conservation measures. In response to high demands for marine products by the hotels, villages are seen using destructive fishing methods as well as unsustainable extraction of other resources such as mangroves.

Along with these changes is the notable exclusion of old generation members of the community and attraction of alien young entreprenеurs who have little information on traditional conservation practices. Menai is becoming a focus for new immigrants many of whom choose to stay. Such demographic changes are likely to cause cultural erosion and ritual elimination. Without empirical studies to document on useful traditional practices for conservation, it is a practical possibility that Menai community may soon loose valuable IK linked to biodiversity conservation, hence the need for this study. It is expected that findings from this study shall help in defining those useful practices and IK that they latter be streamlined into the Government conservation efforts.

This study will therefore provide important information for community based conservation initiatives in the study area. While the study target local communities around MBCA, it addresses the number 7 Millennium Development Goal which aim

to ensure environmental sustainability. It also goes hand in hand with the objectives of National Environment Policies of Zanzibar which are to preserve the biological biodiversity cultural reaches, and natural beauty of Zanzibar's in lands and seas (Z RG, 1992).

1.4 Objectives

1.4.1 General objectives

The general objective of this study is to document on indigenous knowledge, practices and traditional institutions related to environmental conservation and management of marine and coastal resources in MBCA with the view to extract valuable practices that shall be harmonized with government conservation measures.

1.4.2 Specific objectives

i. To identify and document IK and practices linked to biodiversity conservation at MBCA.

ii. To determine the extent and use of IK and practices for conservation at MBCA.

iii. To identify the existing traditional institutions and examine their form of operation in conservation of biodiversity at MBCA.

iv. Examine factor influencing IK and institutions in the study area.

1.5 Conceptual Framework

The empirical analysis of indigenous knowledge and conservation in this study is guided by the Conceptual Framework indicated in Fig. 1. This framework

summarises the main factors that influence sustainable conservation of Menai Bay Area and the chain of causation that links them.

According to this study sustainable conservation is defined as conservation is an ethic of resource use, allocation, and protection. It primary focus in upon maintaining the health of the natural world, it is forests, fisheries, habitats, and biological diversity (MANREMC, 2005a) whereas, indigenous knowledge is defined a by (Mbwambo, 2000) "the sum of experiences and knowledge of a given ethnic group that forms the basis for decision making in the face of familiar problems". He further described it as that knowledge considered to be characteristic of a certain cultural group.

Sustainable resource conservation of marine biodiversity my be realized when local and professional management systems are reconciled. The reconciliation of both local and profession management system (formal and informal institutions) call for equal partnership with the surrounding communities (indigenous practices). The surrounding communities and the political motivation institution include state rules and regulations whereas culturally motivated institutions include norms, taboos and customs that regulate behaviour with regard to conservation and utilization of natural resource.

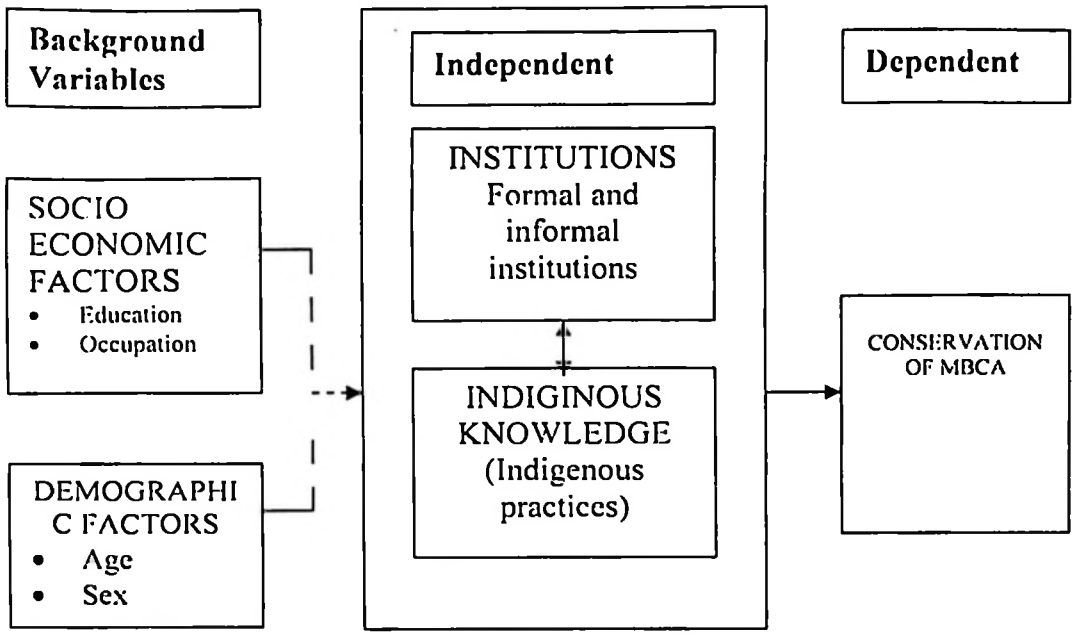

Figure 1: Conceptual Framework

1.6 Research Questions

i. What are the indigenous practices employed in environmental conservation in the MBCA?

ii. Which of these practices are useful in marine environmental conservation?

iii. What is the extent of use of useful indigenous practices in marine environmental conservation?

iv. What are the formal and informal rules and regulations (institutions) involved in conservation and management in MBCA?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview

This chapter encompasses seven sections. Section one explain definition of the key concepts, section two explain linkage between knowledge and practices, section three explain the emergency of community based conservation efforts, section four explain research on indigenous knowledge in conservation. Section five explain from conventional to indigenous knowledge, section six explain the role of indigenous knowledge and conservation, section seven explain institutions and conservation, section eight explain reviews of research of indigenous knowledge and sustainable conservation in the world, in Africa, Tanzania.

2.2 Definition of the Key Concepts

2.2.1 Indigenous knowledge

(Kajembe as cited by Mbwambo, 2000) defined Indigenous Knowledge as "the sum of experiences and knowledge of a given ethnic group that forms the basis for decision making in the face of familiar problems". He further described it as that knowledge considered to be characteristic of a certain cultural group. On the other hand (Kamara, 1994) points out that indigenous knowledge and practices are empirical based on continuous observation by local communities and their close attachment to the natural resources. It is important to understand that indigenous knowledge or traditional knowledge, has over the years played significant roles in solving problems it have immense knowledge to contribute to the micro-environment of the community. In this study indigenous knowledge is collection of

ideas and assumption of the sum of experiences and knowledge of a given ethnic group that forms the basis for decision-making in the face of solving familiar problems, it have immense knowledge to contribute to the micro-environment of the community.

In this study indigenous knowledge refers to 'the local knowledge that is unique to a given culture, unique words and terms to refer to ancient knowledge, unique particular local practices, it is the basis for local-level decision-making in agriculture, health care, food preparation, natural resource management, and a host of other activities in rural communities.

It is important to note in this study that culture can play great part as indigenous activities and practices. Culture can be defined by (Ngouffo, 2001) as being the set of distinctive, spiritual and material, intellectual and affective traits that characterize a society or a social group. It encompasses aside from the arts and letters, the modes of life, the fundamental rights of the individual, value systems, traditions and beliefs.

2.2.2 Institutions

Institutions are defined as the rules and norms that structure human interaction, including their enforcement characteristics and sanctioning mechanisms (North, 1994). Institutions include any form of shared constraint that human beings devise to shape their daily interactions and transactions (Ostrom,1992) refers to institutions simply as working rules, or, rules in use, meaning "the set of rules actually used by a set of individuals to organize repetitive activities".

Informal institutions, such as taboos, have largely been neglected in conservation designs in biodiversity rich, developing countries where park protection has been the major approach for protecting biodiversity. Since most of the world's biodiversity exist outside of protected areas (Murphree, 1994) found that Informal institutions may play an active role in nature conservation. Formal institutions, on the other hand, are rules that human beings devise, such as written rules, laws, and constitutions and are highly associated with the structural complexity of industrialized nations and their division of labour (North, 1994).

Institutions are viewed as concept, meaning and values (Brokensha *et al.*, 1980). An institutional system is said to be useful, when it characterises the social relations, categories of meanings and values in a particular system. Institutions include rules and commons understanding about how problems are addressed and solve in a particular community. Sometimes, institutions are formally established, with electoral procedures for selecting officers, specified duets for members, and rules that outline the rights and duties of the members. In other cases, institutions are not formally constituted but still regulate the use of resource systems over long periods of time. For institutions to exist therefore there should be rules, regulations and norms that are known to and practiced by members of the community (Ostrom, 1990).

Institutions are defined as "persistent" and connected sets of rules and practices that prescribe behavioural roles, constrain activities, and shape expectations. They may take the form of bureaucratic organizations, regimes rule-structures that do not necessarily have organizations attached, or conventions informal practices

(Brokensha *et al.*, 1980).Sometimes institutions and organisations are the key players formed by a group of individuals bound by a common purpose to achieve objectives).

They may be denoted mainly as a tactic type of institutions that have evolved within the local (grassroots) community and have been passed on from one generation to another and encompasses not only local of indigenous, but also scientific and other knowledge gained from outsiders i.e. externally sponsored knowledge. Informal institutions are embedded in the experiences of indigenous or local people and involve intangible factors, including their beliefs, perspectives, and value system. Many part of the world have also shown that local management of natural resources can ensure the maintenance and enhancement of these resources for better than governments .Over past ten to fifteen years, however, there has been a worldwide growing awareness of the role of traditional resources, management institutions my play in helping to conserve natural resources, at least at a local level (McKone and McClure,1992). Hence currently they are seen as pivotal in discussions on sustainable development and poverty alleviation in developing counties (Brokensha *et al.*, 1980).

2.2.3 Formal institutions

Formal or contemporary institutions originate and are normally achieved through political processes i.e government and their local representatives. These have been the dominant mode of instructions. They are based on the Western scientific philosophy and are backed by written law, implying enforcement of rules by the

state (Hassan, 2000). Formal institutions are essentially in explicit format- can be articulated in formal language including grammatical statements, mathematical expressions, specifications, manuals, and so forth. They help to ensure appropriate balance between consistency and flexibility to deal with varying circumstances in a country.

Natural resources have undergone a management change form autonomously devised local resources management systems to custodial management by the state in a uniform, centralized and bureaucratic system. Formal institutions in this study refer to the professional working rules and govern the sustainable management of a particular species or areas. They encompass all the rules and regulations governing management and utilisation of natural resources. They also entail the central established policies and regulations that govern access and utilisation of the natural resources by different resource users.

2.2.4 Traditional institutions

Institutions and actions of local people greatly determine the condition, (success or failure) of the nearby communities management schemes. This is attributed to the fact that local communities generate local institutions- rules in use- and patterns of activities that differ greatly from one locality to the other and differ from those imposed by legislators and bureaucrats from the central governments. To the local people and their institutions, the ritual sites are sacred and should be preserved as such. To the government and other external agencies, the ritual sites like forests, sea, land face the threat of destruction by the local people; hence ways have to be identify to 'save' the coastal areas Niamir (1990).

Traditional systems should not be considered as a sterile collector's mania for bits and pieces of local lore, but a genuine attempt to see what role they can play in the development process (Niamir, 1990). The importance of trees is strongly stressed culturally. For example people are named after trees; trees play a vital and integral role in many initiation ceremonies, such as birth, marriage, and various feasts.

2.3 Institutions and Conservation

According to (North, 1994) the major function of institutions in a society is to reduce uncertainty by giving a stable structure to human interaction. Uncertainty comes from incomplete information about the behavior of other individuals in the process of human interaction. Even if complete information was available, individuals have limited mental capacity to process, organize and utilize information bounded rationality. This bounded rationality, combined with uncertainty in deciphering the environment, imply the need to develop the regularized pattern of human interactions called institutions (Hassan, 2000).

An important point to notice is, formal institutions depend on third-party legal structures, where a regulatory agency often hires its own monitors (forest wardens, police, park guards, etc.) and mediators (lawyers) (Ostrom, 1992). Such a regulatory structure may be financially costly to society (North, 1994). Conversely, informal institutions (like most norms) do not depend on third-party agencies for their promulgation and enforcement. Monitoring of compliance of norms is furthermore facilitated due to the closeness of family members and strong kinship ties (North, 1994).

More over. In the case of common property resources. institutions have to deal with two fundamental management problems that arise from the two basic characteristics of all such resources: how to control access to the resource (the exclusion problem). and how to institute rules among users to solve the potential divergence between individual and collective rationality (the subtract ability problem) has elaborated a more extensive set of design principles based on experience with long enduring institutions for the management of commons. (Ostrom. 1992).

2.4 The linkage between Knowledge and Practices

Many coastal communities link on knowledge and practices on coastal marine resources for their live hood. the coastal zone not only provide human settlements but also support economic development opportunities such as commercial. industrial, mining and agriculture (Briggs. 2005). A good example of linkage between knowledge and practices is Kisimkazi village where a traditional management system involved practices of seasonal closures of fishing areas. particularly for octopus which control on fishing gear (Makame, 2000). In some village there was also a system of forbidding the killing of certain creatures such as dolphin because of special magical power.

The creation of special fishing area that can only be fish to generate money for collective communal activities like special celebrations Crabs fishing were confined to low water during spring tide, these forms have been in practice at Bweleo, Uzi and Fumba. Prawn were subjected a closure for two to three months by Charawe and Chwaka villagers between the short and long rains the time where they were hatching and growing (Tobbison. 1998).

The closure and reopening of the fishing system were ritually announced and enacted. Such systems were enforced with the authority of elders. The violations of such conditions were usually met with punishment in the form of lines or ostracism and even canning. It was also believed that if one went against the laid down prohibitions he might end up losing his boat mysteriously or catching a snake instead of fish. The villagers apply their knowledge to make optimal use of the bay and its resources. (Tobbison, 1998). Taboos may be imposed sporadically, daily, or on a weekly to seasonal basis. Taboos imposed on a weekly to monthly basis are often referred to as a "closed season" in the literature of (Gadgil, 1991).

Closed seasons often coincide with spawning and mating seasons of species (Johannes, 1992). Thus, temporal taboos function to reduce harvesting pressure on particular subsistence resources (Ntiamou- Baidu, 1995). Clearly, not only subsistence species may benefit from such taboos but also other species in the food chains. In large, this group of taboos is based on the same principles as traditional follow rotation systems.

It is very important to understand the linkage between indigenous practices and indigenous knowledge as used in this study refer to the simple and complex decisions taken on daily basis by the local people in their generation and also government and MBCA authority. This link between knowledge and practices help protection and use of biological resources. According to (Makame, 2000) argued that, indigenous knowledge goes beyond destructive knowledge, to what local man does with his store of accumulated knowledge not just what he uses resources for, but also how. Examples of such practices include harvesting of forest resources and

how this affects the long term sustainability of such resources. Others include manipulation of tree resources through pollarding, pruning and respecting (or not) both formal social controls and common sense rules on harvesting of herbs, shrubs and trees and other forest resources.

Community Based Conservation starts with communities as a focus and foundation for assessing natural resource uses, potentials, problems, trends and opportunities, and for taking action to deal with adverse practices and dynamics This is done not in isolation but with cooperation and support from other actors, both from other communities (horizontal linkages) and from higher-level or external entities (vertical linkages). These higher-level actors can be: local or district governments, regional bodies, government agencies, non-governmental organizations (NGOs) universities, or any other institutions that have an interest in resource conservation and management. There are two main reasons why CBC is of current concern to governments, NGOs and Donor agencies like the World Bank. One relates to the objectives of conservation and the other to development. Different weights are attached to each by different interests, but there is usually agreement that both are important considerations (Berkes, 1989). Community natural resource management, which refers to communities having full and generally autonomous responsibility for the protection and use of natural resources. This approach has the derived from or been modelled after indigenous systems of natural resource management, where local knowledge, norms and institutions have co-evolved over long periods of time with the ecosystem in question (Berkes , 1989).

There are situations where Community Based Conservation is more feasible, and more desirable, where human populations and ecosystems are co-adapted and not under stress, and where communities are not confronted with new conditions or new pressures, e.g., from climate change, rapid population growth (natural or due to in-migration), availability of new technologies, weakening of local institutions, new tastes and demands within communities, or changed legal regulations and policy directions. This listing does not suggest that Community Based Conservation is invalidated by such factors but that it is less likely to tenable where such factors are present (Berkes, 1989).

2.5 The Emergency of Community Based Conservation Efforts

During the course of its history, natural resource conservation in Africa has advocated the type of preservationist strategies that have had the effect of alienating local communities from the resources (Dladla, 1995).

Conservationists, ecologists and biologists, realizing the continued decline, focused their attention on expensive scientific and ecological research projects in an attempt to unravel the mystery (Agrawal, 1995). However, they continued to ignore addressing the conflicting people/conservation interaction, which clouded insight into the problems (Cunningham, 1995). Conservationists did not realize that it was very difficult to implement sound resource management without a coordinated approach to the intertwined social, cultural, economic and political problems (Agrawal, 1995).

The awakening from this neglect came about in the 1980s through a shift from a preservationist conservation paradigm to a more integrated approach that recognized the need for promotion and empowerment of the communities by linking economic and social development to natural resources management (Williams *et al.*, 1998). This realization coincided with a general trend in rural development studies to include local communities in planning and management of natural resources in an attempt to promote economic growth through devolution, decentralization and the empowerment of local communities. This facilitated establishment of integrated community based conservation and development program in Botswana, Kenya, Malawi, Mozambique, Namibia, South Africa, Tanzania, Zambia and Zimbabwe between 1979 and 1995 (Williams *et al.*, 1998).

Moreover, Community based natural resource management (CBNRM) framework assess success factors in community mobilization and to provide lessons learnt from program implementation during the last decade. The overall underlying concept behind this approach is to provide incentives for communities to manage natural resources in a sustainable way (Painter, 1995) through the partial transfer of management responsibility, decision making processes and user benefits from designated areas (Arntzen *et al.*, 2003).

2.6 The Role of Indigenous Knowledge in Conservations

Development agencies are beginning to review the role of indigenous knowledge in the development process at the policy level (Titilola, 1990) has demonstrated the cost-effectiveness of adding indigenous knowledge components into development

projects. The World Bank held a seminar on the role of indigenous knowledge for agricultural development. Two influential policy documents have recently been prepared by the U.S. National Research Council. one focused on the conservation of biodiversity. the other on sustainability issues in agriculture and natural resource management. "Development agencies should place greater emphasis on. and assume a stronger role in. systematizing the local knowledge base indigenous knowledge (Warren, 1994).

The document outlining USAID newest Collaborative Research Support Program for Sustainable Agriculture and Natural Resource Management recognizes that indigenous knowledge must play an important role in sustainable approaches to development (National Research Council, 1991). In Brazil, for example, "the long-term management strategies of the Kayapo. which actually increase biological diversity, offer many fundamental principles that should guide development throughout the humid tropics along a path that is both ecologically and socially sound (Poccy, 1985).

However, until recently, indigenous knowledge has been under attack for being backward, static and a hindrance to modernization (Katani, 1999). This attitude has undermined the capacity of the local people to innovate and lowered the status of grassroots innovators, especially women, whose contribution to technological advancement has traditionally been undervalued (Ntiamou- Baidu, 1995).

Local people had, and still have various ways of preserving and managing natural resources. Sacred groves and natural sites have great importance for both nature and culture. The natural values of sacred natural sites relate to the diversity of life forms, habitats and ecosystems that they support and the landscapes and geology of which they are a part. Sacred places also inspire values that derive from their aesthetic appreciation (Katani, 1999).

2.7 Research on Indigenous Knowledge and Conservation

2.7.1 In the world

The UN's Draft Declaration on the Rights of Indigenous Peoples provides strong recognition of Indigenous Peoples' rights and could be a useful reference when considering how questions of governance relate to indigenous peoples. Article 26 states: Indigenous Peoples have the right to own, develop, control and use the lands and territories, including the total environment of their land, air waters, coastal seas, sea-ice, flora and fauna and other resources which they have traditionally owned or otherwise occupied or used. This includes the right to the full recognition of the laws, traditions and customs, land tenure systems and institutions for the development and management of resources, and the right to effective measures by States to prevent any interference with, alienation or encroachment on these rights (Pocey, 1985).

The 1992 Convention on Biological Diversity is also key international protocols for not only protection and sharing of biological resources, but also addressing issues of indigenous knowledge. It calls for to respect, to promote wide application of

indigenous knowledge, as well as to encourage equitable sharing of benefits from indigenous knowledge. There are emerging indigenous movement both in the developed and developing countries for advocacy of indigenous knowledge and traditional resource rights (Pocey, 1985).

According to O'Riordan and Stoll-Kleemann (2002) described biodiversity as both "an ecological and a social phenomenon because it contains properties which are of cultural, intellectual, aesthetic and spiritual values that are important to society." The social aspects of biodiversity bring a whole new perspective that draws away from the indigenous view that biodiversity is totally scientific.

The emphasis of the (Brundtland, 1987) on the importance of species and their genetic materials and their vital contributions to agriculture, medicine and industry highlight the important role of biodiversity in development. Equally important is its ability to stabilize climate, protect watershed and soil and provide nurseries and breeding grounds for various species (Brundtland, 1987). Moreover, (Beattie, 1995) suggest that because biodiversity is beautiful, it is the functional foundation of civilization and it harbours an array of resources beneficial to life it must be conserved by using indigenous knowledge. He also argue that the above reasons substantiate the need to conserve biodiversity at all levels including gene, species and ecosystem; and exploring and incorporating the potentials of biodiversity to improve quality of life using biodiversity based goods and services. Small-scale, resource-poor farmers in developing countries breed local crop varieties for improved production using informal innovation systems based on indigenous knowledge .They often employ their own taxonomy, encourage introgression, select,

hybridize, field test, record data and name their varieties (Lamola, 1992). In Niger, a USAID-funded project has discovered a farmer-based agricultural research and extension system that parallels that of the national government (McCorkle and McClure, 1992). Investigating the nature of farmers' experiments that augment biodiversity could be of considerable use to national agricultural development programs.

2.7.2 In Africa

Indigenous knowledge refers to how indigenous people use their knowledge for their relationship with local environment. Indigenous knowledge is a pluralistic approach to conservation and management of resources. Both indigenous and scientific knowledge is always imperfect; therefore using one does not necessarily reject another. It needs mutual respect and involves an interactive learning process Indigenous knowledge system is a cognitive diversity in the scientific learning process. Just as biodiversity is invaluable for human being, so, too, is cognitive diversity (Holling, 1990).

According to the FAO Forest Resources Assessment (FAO, 2001) forest covers 649m hectares (21.8%) of Africa's land this area has been reducing by 5.3m hectares per year on average since 1990 (FAO, 2001) As the area of forest, especially primary forest, declines, so do the associated traditional knowledge systems concerning their wise use. Important local knowledge persists in many parts of Africa in the realms of hunting-gathering, selective logging, widen agriculture and/or agro forestry (the former two tend to affect a few target species; the latter two

affect the whole landscape). For many communities, practices of using the forest are bound up with religious beliefs, such that changes in beliefs may cause changes in how the forest is used. The local knowledge and practices have also been threatened by the introduction of more intensive agriculture, and the pressures of population increase (FAO, 2001).

2.7.3 In Tanzania

It is very important to put into consideration that coastal ecosystems interact with each other and together sustain a tremendous diversity of marine life, which is an important source of sustenance for indigenous people. For instance, a wide range of important and valued species are found, including an estimated 150 species of coral in 13 families, 8 000 species of invertebrates, 1 000 species of fish, 5 species of marine turtles, and many seabirds (Jidawi *et al.*, 1999).

Moreover Indigenous knowledge provides the basis for problem-solving strategies for local communities, especially the poor people of Tanzania. It represents an important component of global knowledge on development issues. Indigenous knowledge is an underutilized resource in the development process. Learning from indigenous knowledge, by investigating first what local communities know and have, can improve understanding of local conditions and provide a productive context for activities designed to help the communities to sustain environment (Banuri and Apffel, 1993).

Understanding indigenous knowledge in Tanzania can increase responsiveness to clients. Adapting international practices to the local setting can help improve the

impact and sustainability of development assistance. Sharing indigenous knowledge within and across communities can help enhance cross-cultural understanding and promote the cultural dimension of development (Warren *et al.*, 1994).

Having established who the resource users are, it is then necessary to know something about their knowledge and understanding of the local environment A farmer, fisher, logger or hunter will have a certain amount of local environmental knowledge that will allow him/her to carry out a particular activity. This local knowledge may be very substantial, especially if it includes culturally transmitted knowledge accumulated over generations. In some cases, local knowledge may be organized and used in a way which, in effect, amounts to a traditional management system. Cultural beliefs are often found to be a key factor in apparent long-term sustainable use of resources by many groups around the world (Harding *et al.*, 1987). We refer especially to knowledge related to the maintenance of ecosystem resilience, as in traditional agricultural and aqua cultural systems that use a variety of species as opposed to monocultures (Warren *et al.*, 1994).

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Area

Menai Bay is in the south western tip of Unguja Island. This management area covers 470 square kilometres. It lies between latitudes 5^0 40' and 6^0 30'S and longitude 39^0 E on the south coast of Zanzibar. The average temperature is 25^0C. The MBCA is located at the high-water mark along the shoreline of Menai Bay, on the east side extending around the peninsula at Kizimkazi to Mtende Mnarani and on the west side extending past the peninsula where Fumba is located to Nyamanzi. Menai Bay Conservation Area is the area involving 2 regions with 3 districts; West District, Central District, South District, and 18 villages with 27 000 people.

3.2 Justification

Menai Bay Conservation Area was purposely selected. The factors which were responsible in selecting this study include: availability of preliminary data on which this study is based upon; commitment from West District, Central District, and South District in facilitating the research in the field locations that area sensitive from security point of view. Concerns on the sustainability of community based conservation initiatives in the MBCA. Moreover, the district has been selected because it is among the best four protected marine areas of Zanzibar.

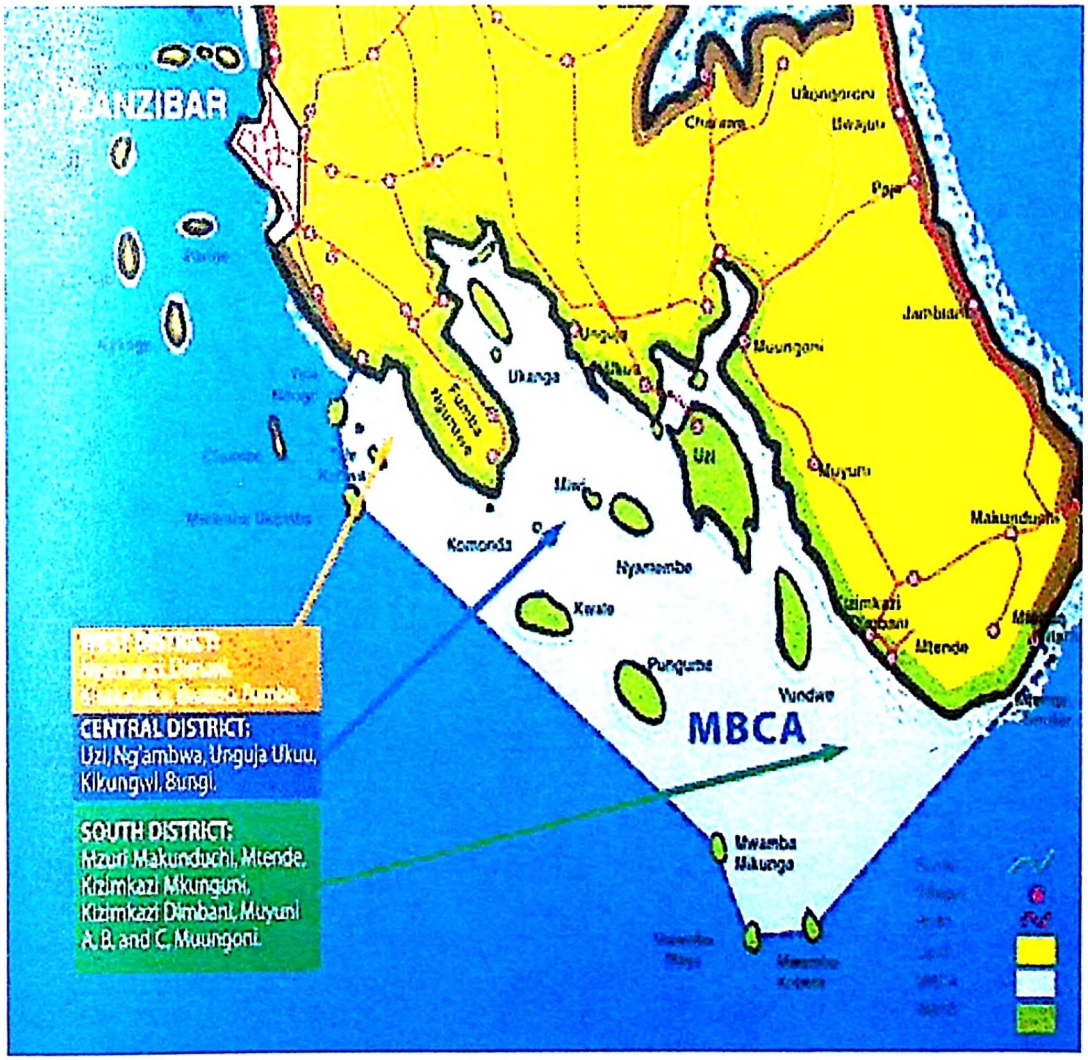

Figure 2: Map of MBCA with selected villages

3.3 Research Design

A cross sectional design was used by the study. According to (Babbie, 1994) a cross sectional design allows data to be collected at a single point in time without repetitions from the sample selected to represent some large population therefore. uses minimum time and resources. Also Mbwambo (2007). Unlike retrospective and longitudinal research designs, cross-sectional research design allows data to be collected at one point in time. In this study the design was considered favourable because of limited time available for data collection. This research is descriptive drawing upon both quantitative and qualitative research designs. It is more descriptive in that, the research describes the trend on the MBCA. It also explored on various sustainability components of the studied MBCA.

3.4 Research Phases

The research was carried out in two phases. Phase one was conducted from September 2008 to December 2008. It was confined to four villages namely Kisakasaka, Kizimkazi, Bungi and Ungujaukuu. The phase was geared towards getting an overview of key issues in respect to indigenous knowledge and conservation in the study area. Phase two was carried out from February to September and more dealt with analysing of data and report writing.

3.5 Method of Data Collection

A multistage sampling approach involving purposive and random techniques was employed. According to Kombo and Tromp (2006), the multistage approach is useful when the sample elements are selected in order to fulfil right criteria for the

purpose of study. A purposive sampling was used for the selection Menai Bay Conservation Area based on availability of biodiversity doorway.

The four villages were also purposely selected from 19 villages based on their closeness. Moreover, the random selection was used in selecting one street from each village to make a total of four streets. The four villages were within the Central and the South districts, all of which lie along the South coast of Zanzibar Island. A survey was conducted in four villages using structured questionnaires as indicated in Appendix 1 to capture liable information on household characteristics, identification of Indigenous knowledge, extent use of indigenous knowledge, and institutions of the study area 120 respondents (fishermen and farmers) were selected randomly by holding a village meeting, in which, by the help of the village leaders, 30 names of respondents to be interviewed in each village were selected.

Efforts were made to diversify the category of respondents to include both male and female respondents as was possible without loosing the randomness of the sampling. However, while conducting the interviews, it soon became clear that most villagers were not available because they were busy engaged in seaweed farming. Seaweed farming involves activities in which women farmers have to spend many hours out of their homesteads. Thus the interview had to be done only with very few women farmers, and plenty of fishermen who could avail themselves. Nevertheless, the numbers of respondents represent a valid spectrum of villagers involved in fishing related activities.

Table 2 in chapter four summarizes the household characteristics of the respondents in the four villages surveyed showing also the proportion of respondent who are actively engaged in fishing related activities.

3.5.1 Qualitative data collection

3.5.1.1 Focus group discussion (FGDs)

In order to capture enough information related to indigenous knowledge and conservation in the study area the FGDs were adopted. There were two FGDs in each village. Each group comprised about 8 – 12 participants, one group was for men and the other was for women to allow full participation. The main and assistant researchers used guiding questions to lead the discussions which simplified the coding process for data analysis. Therefore FDGs was taken as unit for assessing the sustainability conservation of MBCA in the study area.

3.5.1.2 Interview guide/check list

Set of questions were asked to workers of community development and Menai Bay officers to capture important information related to household and socio economic characteristics respectively. Checklists were administered to allow coding and analysis of data collected.

3.5.2 Quantitative data

Questionnaire survey was employed to collect quantitative data from fishermen. Specific techniques were used for each specific objective. The sampling unit for this study was individual MBCA' ordinary members of household. Heads of households

was subjected to the questionnaire, but in occasion where the head was not be around a young boys and their mother who participated in fishing activities was involved.

3.5.2.1 Data collection for objective one

Objective one focused on identification of indigenous knowledge in the study area. Primary and secondary data was collected objective one, house hold questionnaire and focus group discussion was used to obtain data. Primary data collection was done through face-to-face interviews and observations. Both open and closed-ended questions were used. Structured questionnaires were administered to the household members, while checklists were used for MBCA officers. And FDGs were used for selected groups. Data was also obtained through observations and reviewing of existing records within the study area.

3.5.2.2 Data collection for objective two

Objective two focused the extent and use of useful indigenous knowledge. Structured and non structured interview were used to gather information for objective two. It is a research instrument for data collection that involves the collection of data through direct verbal interaction between the interviewer and interviewee. Focus group discussion and house hold questionnaire was used to collect data of objective number two. Respondent show degree of uses of indigenous practices for conservation .In consultation with *Sheha*, a list of the household active members (fishermen) in the study area was prepared to be interviewed, based on their location, type of their practices and activities, for example fishing, farming,

seaweed planting, and others related to resources utilization. Requirement was that to determine the extent and use of useful indigenous practices for conservation of study area.

3.5.3.3 Data collection for objective three

Objective three focused on identify the existing traditional institutions and examine their form of operation in conservation of biodiversity at MBCA. In this object three unstructured interview was employed in order to get one depth information about particular cases of interest, foe example information about rituals, norms and taboos. Also structure questionnaire were used to collect information about formal institution for example information about rule and regulation governing Menai Bay Conservation Area were asked. Structured interview involved subjecting every informant in a sample to the same stimuli in which interviewer asked each respondent similar question. This is because the study wanted to seek data on specific issue such as: history/formation, nature and types, organizational structure, and sustainability trend of traditional institutions for conservation and management of MBCA. An additional checklist was used with district community development officers and *Sheha* to gather information on nature and types, and general view on sustainability trend of informal and formal traditional institution in the study area.

3.6 Sampling Strategy

3.6.1 Sampling strategy for FGDs

In order to capture information related identification of indigenous knowledge of the study area FGDs is one among best method. The study conducted two FGDs in each

village. one for men and the other for women. Each FGD had 8-12 participants selected from the village leader *Sheha*. In order to reduce bias in selecting the participants a random sampling method was employed.

3.6.2 Sampling strategy for questionnaire survey

This study involved four villages Unguja Ukuu. Kisakasaka. Bungi. and Kizimkazi for focus group discussion and house hold questionnaire. These villages were purposively selected on the basis of their closeness to the MBCA. The study conducted two FGDs in each village. one for men and the other for women. Each FGD had 8-12 participants selected from the village registers by the researcher by assistance of local leader called *Sheha*. In order to reduce bias in selecting the participants a random sampling method was employed.

Table 1: Number of villages members Drawn for Study area

Village	Total H.H	Sample H.H	Percentage
Bungi	475	30	6.3
Kizimkazi	502	30	5.9
Kisakasaka	122	30	24.5
U/Ukuu	300	30	10

The first stage was to select the study area at district level and division level. The purposive technique was employed at district level while at division level the random sampling method was employed.

3.7 Method of Data Analysis

Prior to analysis, qualitative data were processed categorized, summarized and presented in a tabular form. Common and agreed points or views by all discussants from the FGDs were listed in point form, summarized, and coded to resemble to quantitative data to facilitate analysis. Quantitative data were verified coded and transferred to the computer code sheet for process, frequency and percentage. This involved computer data entry, using SPSS 12.0 programme, followed by data editing and cleaning.

3.7.1 Qualitative data analysis

The qualitative data were analysed by summarising the attitudes or opinions of discussants recorded in the FGDs by the note takers. The analysis employed an ethnographic approach. That is, relying on the direct information given by the respondents according to the themes used during the discussion. On FGDs, the group and not the number of participants, is the main unit of analysis. To a large extend, the findings provided refer to the conclusions reached by each group on a particular theme of discussion.

3.7.2 Data analysis for objective number one, two and three

Responses and proceedings of the focus group discussions were recorded. The cut and paste analysis was used to select the relevant information from key informants and other various respondents; this information was compiled forming the results and discussion chapter.

The quantitative data were edited, summarized and coded before entered/punched into computer for processing. Statistical Package for Social Sciences (SPSS) computer program version 12.0 was used for analysis. Also, a multiple responses were used to analyze all open ended questions in the study. Descriptive statistics such as frequencies, percentages and means were computed to determine distribution of the responses. After the analysis research findings were put in categories based on the research objectives. Presentation is done through use of tables and figures.

The components of verbal discussion with key informants were analyzed in detail using content analysis method. In this way, the content of the interviews was subdivided into smallest meaningful information. This helped the study in ascertaining values and attitudes of the respondents.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of the Respondents

This section explains the background variables (demographic and socioeconomic factors) which influences sustainable conservation. The demographic factors used in this study are age and sex of respondents, whereas, the socio-economic parameters examined in this study are level of education and main occupation of the respondents. The purpose of choosing these characteristics was to determine whether they have any effect on the understanding of indigenous knowledge practices and traditional institutions on sustainable environmental conservation and management of marine and coastal resources in Menai Bay Conservation Area (Table 2).

Table 2: Socioeconomic characteristics of the respondents

Age	Frequency	Percentage
Less than 18 years	19	15.8
18-35 years	50	41.7
36-55 years	31	25.8
Above 55 years	20	16.7
Total	**120**	**100.0**
Respondent sex		
Male	117	97.5
Female	3	2.5
Total	**120**	**100.0**
Occupation		
c/servant	4	3.4
Fishing	36	30.0
Farming	28	23.3
Fishing and farming	52	43.3
Total	**120**	**100.0**
Education		
None	5	4.3
Primary education	86	72
Secondary	28	23
Higher education	5	4.1
Madras	20	16.6
Total	**120**	**100.0**

4.2 Age and sex of the respondents

Figure 3 presents the age distribution of the respondents. It can be noted that most respondents were aged between 18 and 55 yrs. The age distribution is descriptive of what may be expected in most social settings. It is common observation that active working class in Tanzania includes individuals ranging in age between 18 and 55 years. Nearly 70% of the respondents fell under this category. The presence of the children (i.e. <18 yrs) group of fishermen provides a continuum of both vertical and horizontal cultural transmission from one generation to the next. Acerbi and Parisi (2006) have suggested that intra-generation transmission (horizontal) of culture adds

variability to cultural evolution especially where there is rapid changing environment. Likewise vertical transmission through wide age differences may help on conserving cultural taboos, norms and values of a society. At Menai Bay Conservation area such a mixture of age groups could be a conduit through which traditional conservation methods may be sustain over a long term. Young fisherman can learn behaviours, information, values, norms and taboos that governed the extent and use of natural resources conservation from the senior members of the community. Mixed age groups however, could also be fora for conflicts within the community especially where members of the new generation try to extricate themselves from the bondage of taboos upheld by their parents.

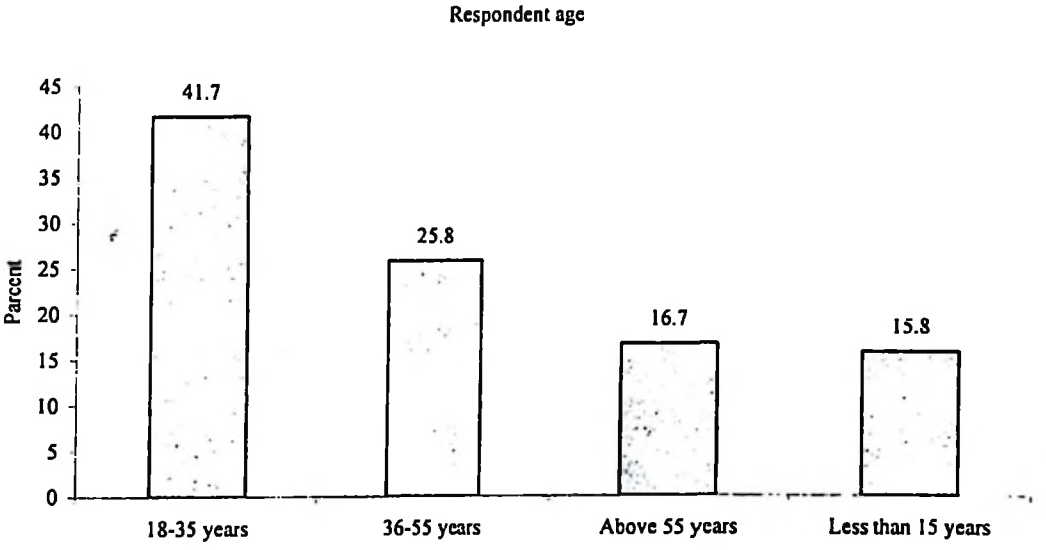

Figure 3: Respondents age

Table 3: Age distribution of male and female respondents

	Response (%) Respondent Age				
Respondent Gender	**Less than 15 years**	**18-35 years**	**36-55 years**	**Above 55 years**	**Total (n = 120)**
Male	100.0	96.0	96.8	100.0	97.5
Female	0.0	4.0	3.2	0.0	2.5
Total	**100**	**100**	**100**	**100**	**120**

4.2.1 Sex of respondents

Majority of the respondents were men, an observation common in most coastal societies of Tanzania. The low representation of women in fishing activities reflects the pattern of gender roles in Zanzibar, a strictly patrilineal society, and where it is common place for women not to be involved in outdoor activities. Women are traditionally expected to engage themselves in domestic duties such as taking care of children, preparing meals, fetching water and cleaning the house. Indeed there were only three female respondents (Table 3). The near absence of females < 2% among the respondents may have skewed observations in this study towards male biased opinion on IK matters. The low representation of women in this study does not provide sufficient conclusive assessment of roles of women in conservation activities at Menai. It is interesting though, to note that the two female respondents were aged between 18-35 yr age group. In rural Zanzibar girls marry at an early age, usually to spouses much older than themselves (Warren, 1991) leading to early divorces. However, 18-35 years is an age group normally expected to be the vanguard of cultural change (Warren, 1991). Thus women in such age group in Zanzibar provide a bridge between the old and the new ways of biodiversity

conservation on account of being married to the older generation (inter-generational cultural transmission) whilst still able to share common elements of the new generation (intra-generational cultural transmission).

4.2.2 Level of education of respondents

Tables 4 show level of education attained by various age groups of males and female respondents. All females had attained some form of education but none of them had gone beyond the primary level. For the males most of the 18-35 yr olds had attained primary education with a few also having acquired secondary and higher education. It was surprising however to note that no female had *madrasa* education. This is because madras's education is supposed to be compulsory for both male and female. One possible reason for this anomaly is the fact that many women do not regard madras as a formal education and consider it more like religious tuition. Male respondents had a different opinion on madras education because it is common knowledge in Zanzibar that males take the leading role in performing nearly all religious rituals. Such roles require some recognized level of religious training.

Graduates from primary schools or above can be considered to be informed enough on matters regarding biodiversity and conservation. Likewise the madras a graduate have fair knowledge of conservation drawn from their Islamic teaching.

Table 4: Education level of male and female respondent

	Respondents (%) Respondents gender		
Education	**Male**	**Female**	**Total**
None	4.3	0.0	4.3
Primary	52.0	20.0	72
Secondary	13	10	23
Higher education	4.1	0.0	4.1
Madrasa	16.6	0.0	16.6
Total	**90**	**30**	**120**

4.2.3 Main occupation of the respondents

Occupation in this study means any work related to fishing and farming activities.

It has been revealed that 43.3% of the respondents in the respective area are simultaneously engaged in fishing and farming. Fishing is a major economic activity in the area and the residents are heavily dependent on the marine environment for their daily subsistence. Fishing provides most of the households with cash and food, whereas agriculture provides subsistence needs Torell and Karen (2006). While 31.7% and 23.3% deal with only fishing and farming respectively, only a negligible number of residents are civil servants. The trend of occupation above has been dictated by various factors, including inability to merge the two occupations for those dealing with one. But some manage the simultaneous occupations of fishing and farming thanks to the time schedule, nature of their fishing gear, seasons and fishing methods. They deal with almost onshore fishing as opposed to deep sea or long-distance fishing that would otherwise prevent them from farming since the later would require days away in the ocean or a faraway location like Dar es salaam, Tanga and Bagamoyo. As a rule, depending on the season, nature of the fishing gear and methods applied, an onshore fishing would take only a few hours away from

home, providing one with enough time for farming. This is in contrast to the 31.7% who resorted to fishing only who are characterised with modern gear enabling them to sail long distances for remarkably higher earnings in a faraway market. Unlike the fishing-only occupants, the farmers are a poorer and less able class who solely depend on petty onshore seasonal fishing, seaweed farming and rope making. But the seaweed farming and rope making as alternative sources of income for the villagers play a positive role in natural resources conservation. However, the two occupations are not the only positive factors in the preservation of natural resources. Deep sea and distant fishing are also reputed for their significant role in preservation of the local natural resources since they remain intact at least from the local fishermen's involvement (Fig .4).

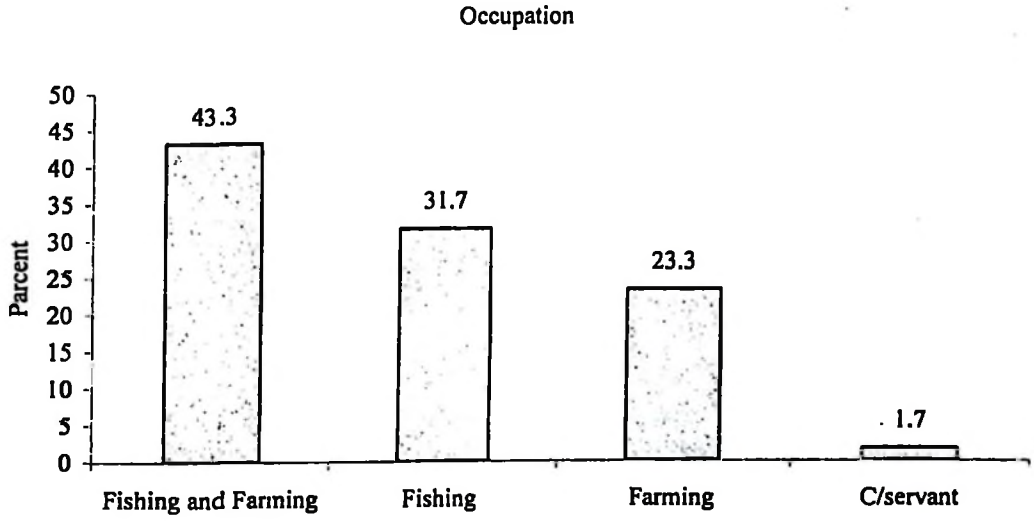

Figure 4: Occupation of the respondents

4.3 Identification of Indigenous Practices in Fishing

4.3.1 Locating traps and nets

Table 5 shows the various forms of marking fishing sites employed by the fishermen. More than half of the respondents indicated that stars in the sky are the primary reference marks that are used for locating previously set fishing traps (gillnets. lines. basket traps, lines. wooden traps etc). A few fishermen 8% also indicated that big trees on land may be used as reference marks. Further probing on this question revealed that fishermen may use a combination of all the major options in defining their reference marks. The principal determinant of the method used is the distance from the shore. Fishermen going in larger vessels further away from the shore tended to rely more on the starts than those in smaller boats plying close to the beaches. Similar observations have been reported by other workers in East Africa (Johannes. 1992).

4.3.2 Practical knowledge by villages in the study area

Similar table shows the use of various reference objects for setting traps or defining fishing grounds in the four villages. In all four villages the use of under water marks is employed to nearly the same extent. However, there were differences in the extent of using terrestrial land marks. whereby at Kisakasaka and Kizimkazi such marks were hardly employed. In both villages fishing is done further out from the shore compared to the other two villages, primarily because fishermen in Kizimkazi and Kisakasaka have better fishing boats and gears than in Unguja Ukuu and Bungi.

Table 5: Practical knowledge by locating traps in Villages

Practical knowledge in the study area	Response (%) Villages Respondents by villages				
	Unguja Ukuu	Bungi	Kisakasaka	Kizimkazi	Total (n = 120)
Use marks	63.3	53.3	56.7	53.3	56.7
Use stars	23.3	33.3	36.7	46.7	35.0
use big trees	13.4	13.4	6.8	0.0	8.3
Total	**100**	**100**	**100**	**100**	**100**

The use of terrestrial land marks (e.g. big trees) provides an example of holistic conservation measures linking the land with the sea. In recognition of the importance of such landmarks one may presume that it is in the interest of the fishermen that terrestrial land marks remain preserved. Basket traps in Swahili *dema* are usually set close to the beaches using reference marks on land. The practice involves setting the traps at low tides and visiting them for inspection or collection at high tides. Traps are set in a manner that would normally be on a site in line to an identified object (e.g. baobab tree, coconut palm, mango tree etc.) on the land.

Gillnets are set in further out from the shore. Preferred sites for locating the nets are those areas known locally as m*kondo* which is an area of fast moving ocean current usually formed by a narrow channel between two separate formations of coral rigs. Such locations provide breeding grounds for fish and are thus more likely to give higher catches to the fishermen. When setting nets along *mkondo* fishermen mark location of their nets using stars in the sky (if at night), or under water coral reefs

during the day. The IK for using stars or identifying correct reef formation for setting nets and traps is well established in the community. Boys as young as 12 starts learning the art from their elders when taken to sea. By age 15 a boy is expected to be able to navigate along the shore as far out as 1-3 km off shore. This ability reflects early training and Trans- generational passage of IK.

4.3.3 Scheduling the fishing activities

Table 6 shows the common IK cues used in defining fishing schedule and locations of fishing grounds. The study revealed that by scheduling fishing activities at a particular time of the year can mitigate any conflicts toward key areas example spawing , feeding and migration. These spatial and temporal scheduling mitigations could potentially apply to the identified sensitive fisheries areas in the MBCA. Optimal scheduling to avoid sensitive life stages is particularly important for species at risk. In all villages a combined cue of Wind and Lunar cycle is employed. Generally, fishing schedule is concentrated during or shortly before the new moon (Waxing Crescent) and throughout the new moon period .During this phase the moon is invisible, creating dark skies ideal for night fishing. This phase also corresponds to period of high tides, locally known as *bamvua -kubwa*. A period of high fishing activities ensues lasting for about 5-9 days (Table 6). This is followed by a lull in activities before another phase shorter than the first one comes into effect. This phase begins at Waning crescent in swahili *muandamo* wherein fishing activities are done at low level (lower catches and shorter hours at sea) . This level of activities *bamvua-ndogo* continues throughout the third quarter moon to Waning Gibbous, a period just shortly before the full moon . At full moon fishermen usually

come offshore for boat repairs in Swahili *kukalafati* and for farming activities. Reporting on fishing activities in L. Victoria (Jidawi, 2001) described a similar pattern of fishing schedules.

Table 6: Respond on determine the duration of *Bamvua*

Determine the duration of Bamvua	Village %				
	Unguja Ukuu (n=30)	Bungi (n=30)	Kisakasaka (n=30)	Kizimkazi (n=30)	Total (n= 120)
Wind and Arabic calendar	76.7	93.3	86.7	93.3	87.5
Arabic calendar	23.3	6.7	13.3	6.7	12.5
Total	**100**	**100**	**100**	**100**	**100**

In the current study area the villagers maintain some kind of unpublished calendar set on the basis of lunar phases. This calendar is recorded on pieces of sticks strewn on a string, normally kept at the pulpit of the local mosque. It is on this account that women have little access to the counting of the days. The local *Muezzin* is the custodian of the calendar and is usually the trusted person on foretelling about dates for *bamvua*.

In addition to the lunar phases, additional cues used for setting fishing schedules include speed of the wind, colour of the water and tide lines as shown by sea grasses washed ashore. Higher catches are expected at high tide when the sea is calm and waters are deep blue. The converse applies during stormy conditions, when fishermen normally do not set out to sea. The strict adherence to lunar regimes by the local fishermen means that fishing is done for a relatively short period in a month (just about 14-16 days altogether) (Table 7). This arrangement allows for fish stock replenishment and therefore some kind of conservation. In addition, a number

of respondents (personal observation) indicated that many fishermen do not go out fishing on Fridays or on religious holidays, believing that not doing so attracts bad luck and amounts to committing a sin. Likewise when a fisherman happens to capture a dolphin it is customary to release her/him, in order to avoid misfortunes in the family. Perhaps this helps in conserving the dolphins within MBCA.

Table 7: Response on duration of *bamvua*

	Response (%) Village				
Period of *Bamvua*	**Unguja Ukuu (n=30)**	**Bungi (n=30)**	**Kisakasaka (n=30)**	**Kizimkazi (n=30)**	**Total (n= 120)**
5 days	3.3	0	0	0	8.0
7 days	43.3	83.3	50.0	26.7	50.8
8 days	26.7	13.3	26.7	43.3	27.5
9 days	26.7	3.4	23.3	30.0	20.8
Total	**100**	**100**	**100**	**100**	**100**

Figure 5: Activities at the landing site during *bamvua*

4.3.4 Locating fishing grounds

One of the most critical elements of successful fishing is the ability to locate the right fishing spots. Since the fishermen in this study have no access to modern technology (e.g. sonar equipments, GPS etc.) they have developed their own IK that is applied for locating correct fishing grounds. This study found out that, the potential of locating fishing grounds is to catch more fish and the big fish. During FDG they reported that, the common IK objects used for locating fishing grounds. Nearly half of the fishermen reported that they are able to locate fishing grounds by using indicators of fish habitats. These included marine coral formations. Some fishermen may combine other cues e.g. knowledge of fish migratory routes and marine vegetation in identifying fishing grounds.

4.3.5 Migratory Fishing *Dago*

About two thirds of all fishermen in the four villages practice some form of migratory fishing (Table 8). This form of fishing, locally known as *dago* in Swahili involves long stay away from villages in camps set up on islets or any other convenient place outside the village for periods that may last for up to three months. According to 1988 Fisheries Act, *dago* is defined as camping at any place within or in the proximity of the Menai Bay Conservation Area for the purpose of using such camps as a base for launching fishing trips.

Table 8: Response on migratory fishing

	Response (%) Village				
Migratory Fishing	**Unguja ukuu (n=30)**	**Bungi (n=30)**	**Kisakasaka (n=30)**	**Kizimkazi (n=30)**	**Total (n= 120)**
Always engaging	73.3	70.0	63.3	53.3	65.0
Engaging but not always	23.3	13.3	36.7	43.3	29.2
Not engaging	3.3	16.7	0.0	3.3	5.8
Total	**100**	**100**	**100**	**100**	**100**

There are differences in the proportion of fishermen practicing *dago* or its variant among the four villages. Proportionately more fishermen in Unguja Ukuu and Bungi practice *dago* than in Kisakasaka and Kizimkazi. This observation corroborates the earlier one where fishermen at Unguja Ukuu and Bungi were shown to be more likely to use fish migratory routes than those at Kisakasaka and Kizimkazi. Fishermen at Kisakasaka have little cause for setting out on *dago* because their area is sufficiently rich in fish stock. Sites for *dago* are normally decided by a consensus between local leaders and government fisheries authorities. Usually the local leaders *Shehas*' propose a site after consulting the fishermen. The proposed site is then vetted by the fisheries officer who in turn issues a licence that stipulates the number of fishermen to be involved, the type of fishing gears, the hygienic practices at camp sites, the method duration of fishing and duration of camping. For camps set outside the MBCA fishermen only need a fishing permit that does not stipulates duration of camping.

Table 9 shows the level of adherence to the requirements stipulated in the *dago* permits. Overall just about a quarter of the fishermen acquire permits when setting

out for *dago*. There were notable variations among the four villages, but in no village was the permit solicited by more than 45% of the fishermen. Likewise, less than one third of the fishermen abided to the regulations defined in the permits.

Restrictions outlined in the permits were intended to help in the conservation of MBCA. Failure by the fishermen to abide by them reflects negatively on community participation in conservation efforts. This may well be an indication that there is little congruence of opinion on conservation between the local fishermen and the formal authorities. Indeed fees attached on the permit could be the reason for apathy by the fishermen towards conservation. It is common knowledge that where government collects revenues from its subjects, the subjects tend to believe that they have already paid for all the expected services e.g. construction of pit latrines.

Table 9: Percentage response on rules and regulation involves in *dago*

	Village Response (%)				
Rules and regulation involves in *dago*	**Unguja ukuu (n=30)**	**Bungi (n=30)**	**Kisakasaka (n=30)**	**Kizimkazi (n=30)**	**Total (n= 120)**
Authority permit	43.3	40.0	13.3	10.0	26.7
Restriction of catches to be sold outside camp	23.3	26.7	30.0	43.3	40.8
Construct temporarily pits	23.3	16.7	23.3	16.7	20.0
Restricted to use destructive gears	10.0	16.7	33.3	30.0	22.5
Total	**100**	**100**	**100**	**100**	**100**

A study during FGDs also found out that when a *dago* rule or regulation is violated it's upon the *dago* leader to take a disciplinary measure, ranging from a minimum fine of 500 shillings to a maximum jail sentence against the offender, where verbal warning has failed.

4.4 Extent of the use of Indigenous Knowledge in Fishing Areas

The extent of the use of indigenous knowledge in this study focuses on the extent over how fishermen practice biodiversity conservation. They include application of indigenous knowledge in fishing, availability of marine species and other related activities. In this study, seasonal closure refers to a halt in fishing activities for a considerable long duration to control and regulate preservation of marine environment in a given area. (MANREC, 2005a) observed similar practice as applied in the islands of Pungume and Kwale for the preservation of marine biodiversity. The two islands were closed during the South-East Monsoon, and other villages also applied the practice in the preservation of octopus.

During focus group discussion it was revealed that most coastal villages within the study area were influenced by seasonal variations. The study showed that in many areas the fishing catches were reportedly higher during six months of the cool North-East monsoon winds starting October than during the next six months characterized by stronger winds and rough seas of the South-East Monsoon. As a rule, North-East Monsoon winds pave a way for maximum fishing, as opposed to fishing and sailing unfriendly South-East Monsoon that leads to low catches. Therefore, it goes without questioning that the South-East Monsoon is environmental friendly when it comes to marine biodiversity conservation.

It was also revealed in this study that about one-third of the respondents selected the islets (Nyemembe and Miwi)as the most suitable sites for seasonal closure, while about 27% of respondents preferred Pungume Island for the purpose. More than

one-third of the respondents preferred Kizimkazi and the neighbouring villages for seasonal closure. (Fig. 6).

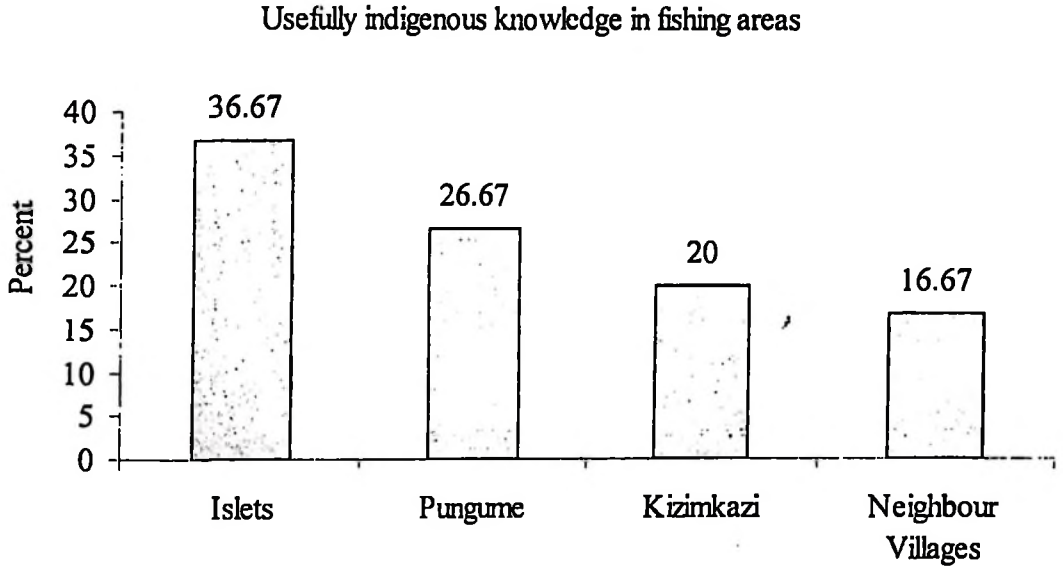

Figure 6: Percentage response on extent and use of indigenous knowledge

4.4.1 Extent of use of marine species

Though hard to get exact amount of the catches due to local fishermen's lack of traditional practice to measure the fishing products in kilograms, the response indicates about half of the respondents preferred to catch tuna fish, billfish, kingfish and sharks. It should also be born in mind that the catch limit of the specie depends on the kind of gear and the site of fishing. (Jiddawi, 2002) who conducted their research at a different area found out that more than 500 species of fish were used for subsistence purposes, with reef fishes like emperors, snappers, sweet lips, parrotfish, surgeonfish, rabbit fish, groupers and goatfish being the most important category.

As eel fish, catfish, mullet fish, silver biddy and shrimps accounted for third of all catches, the lowest catch of about 20% was observed in relation to shark, tuna fish, turtle and dolphin. But as fishing of turtles and dolphins is officially considered illegal and traditionally, a taboo believed to call bad omen, the fishermen tend to return their catches back to the water on accidental fishing (Table 10).

This system of fishing to large extent has an implication to natural resources conservation especially in Kizimkazi and Unguja Ukuu where the specie diversity is notably the highest.

Table 10: Use of marine species in the study area

Common species	Village Response (%)				
	Unguja Ukuu (n=30)	Bungi (n=30)	Kisakasaka (n=30)	Kizimkazi (n=30)	Total (n= 120)
tuna, billfish, kingfish, and sharks	50.0	40.0	43.3	56.7	48.3
eels, catfish, mullet, silver biddy and shrimps	30.0	46.7	36.7	20.0	32.5
sharks and tuna, accidental turtle and dolphin	20.0	13.3	20.0	23.3	19.2
Total	**100**	**100**	**100**	**100**	**100**

4.4.2 Amount of fishermen per season in the study area.

Season *bamvua* in this study means fishing period that appears twice in a month (Table 11). The study has revealed that the majority of the respondents have given the figures of the fishermen who visit the four villages to be ranging between 150 and 230 per season. Though about 7% respondents have given an unusually high number of 300 fishermen per season, the figure is countered by about a quarter of

respondents who said only 100 fishermen visit the four villages per season. If similar study conducted by (MANREC, 2005a) has revealed that seasonal fishing had some implication to biodiversity conservation, the table above is its supplement showing the extent of how fishing plays its role in biodiversity conservation. In a situation where the fishermen in question do not go out fishing all at a time they provide enough room for biodiversity conservation, unlike the situation where the 300 fishermen as expressed by a group of respondents would get out for a collective fishing. However, similar study done on annual basis on Misali Island by (MANREC, 2005b) indicated that at least 1640 fishermen including 1148 full-timers fish in Misali water each year.

Table 11: Amount of fishermen in a study area

Amount of fishermen per season	Response in (%)				
	Respondents by villages				
	Unguja ukuu	Bungi	Kisakasaka	Kizimkazi	Total (n=120)
100	26.7	0.0	36.6	33.4	24.2
150	33.3	13.3	46.7	43.3	34.2
230	40.0	60.0	16.7	23.3	35.0
300	0.0	26.7	0.0	0.0	6.7
Total	**100**	**100**	**100**	**100**	**100**

4.4.3 The extent of use of indigenous fishing methods in a study area

The study shows a tendency of mixed varieties of fishing methods ranging from 45% including those using the cheapest and simplest lines and wooden traps to merely 20.8% who use relatively more sophisticated lines, nets and fence (Table 12). The most common fishing gears are gill nets, shark nets, small-scale purse seine and a variety of fishing lines Torell and Karen (2006). The use of these methods also

goes in line with both economic status of the user and his indigenous knowledge of fishing. It is equally important to note that species composition and size of the fish varies with gear type and location, according to (Jiddawi, 2002). Their study has shown that various fishing techniques are applied using uncomplicated passive fishing gears such as basket traps, fence traps, nets as well as different hook and line techniques.

A study on the four villages has shown that a vast number of residents are not economical sound to own nets and fence, but they are very much aware of the environmental conservation that they all prefer the legal and environmental conducive methods and fishing gear to the modern gear.

Moreover, in a focus group discussion, the respondents suggested better alternative gear for deep sea and distant fishing that they could avoid fishing at their locality that they could conserve their local environment. But also they revealed that unlike the non-indigenous fishermen from other areas who use destructive fishing gear that indiscriminately do away with marine species, they use legal gear that limit the catches.

Table 12: Indigenous fishing methods in a study area

Fishing methods	Response (%) Respondents by villages				
	Unguja ukuu	Bungi	Kisakasaka	Kizimkazi	Total (n=120)
Lines and wooden traps	46.7	63.3	33.3	36.7	45.0
Nets and basket	26.6	36.7	40.0	33.3	34.2
lines , nets and fence	26.7	0.0	26.7	30.0	20.8
Total	**100**	**100**	**100**	**100**	**100**

4.4.4 Alternative indigenous activities

Table 13 show how residents of the four villages deal with other indigenous activities apart from fishing where necessary, including the time of the low season or at the end of *bamvua*. During this time villagers resort to seaweed farming and rope making using coconut husks treated with salt water to supplement their income since the former enjoys wider market by virtue of its being an export crop than rope making which is limited to the internal market. Similar study done by (FAO, 2001) in Zanzibar reported that Rope making is one of the long-time activities mostly done by women (individually or collectively) who live in the villages along the coast. Due to the length of the process, the activity can not be relied upon as the main source of income. However, ropes derived from this source remains a cultural symbol of Zanzibar as it is used in making beds, in dhows and in construction. Although not traditional activity, seaweed farming has gained popularity amongst islands women due to its "instant money". Between 20 000 and 25 000 people are currently engaged in seaweed farming in Zanzibar and most of them are women.

Table 13: Indigenous activities done apart from fishing in the study area.

Activities done apart from fishing	Response (%)				
	Respondents Age				
	Unguja ukuu	Bungi	Kisakasaka	Kizimkazi	Total (n=120)
Rope making	46.7	56.7	43.3	30.0	44.2
Seaweed farming	53.3	43.3	56.7	70.0	55.8
Total	**100**	**100**	**100**	**100**	**100**

Figure 7: Seaweed farming in the study area

4.5 Institutions for Conservation and Management in the Study Area

Menai Bay Conservation Area is governed by rules and regulations referred to as formal institutions. But the study has revealed that there also exist informal traditional institutions including traditional healing, ritual sites and sacred species. Results from survey and focus group discussion have been used to reflect the sustainability trend of formal and informal institutions in the study area.

In this study formal and informal traditional institutions which were involving in conservation have been discussed. According to this study formal tradition institution referred to institution that has, legal registration number, written rules, laws and constitutions that guide the behaviour of its members while informal

traditional institution has unwritten norms of behaviour, conventions and self-imposed code of conduct. (Ostrom, 1992).

Local and traditional knowledge do not exist in a vacuum but are embedded in local institutions. Similarly, property rights are embedded in institutions which may simply be defined as the set of rules actually used (Ostrom, 1992). Rule-making as well as enforcement, dispute management, and the formulation of social norms in general and the evolution of cultural conventions dealing with natural resources are all matters that pertain to institutions.

4.5.1 Formal traditional institution

Formal institution in the study area refers to a set of rules made by the Department of Fisheries and Marine Products and MBCA officials. The MCBA is managed locally by the community and government officials with technical assistance by the World Wild Fund (WWF). The Department of Fisheries and Marine Products and the WWF provide technical and financial support to the MBCA. The main goal of MBCA is to conserve the natural resources of the area for sustainable use with active community participation. The objectives of the project are: to protect the marine ecosystem and improve resource yields through management systems that include active local community participation; involve local communities in planning, implementation and monitoring of the natural resources of Menai Bay Conservation Area; increase awareness of conservation through educational and public awareness programs; and support biological and socio-economic research and monitoring to provide the basis for rational management. Menai Bay does not have

any exclusive zones where fishing is not allowed, but it has slightly stricter fishing regulations than other parts of Zanzibar

4.5.2 Formal rules and regulation governing MBCA

1. No person shall practice or undertake any destructive fishing within the area.
2. No person shall use or intend to use any fishing net, which is less than 2.5 mesh size.
3. No person shall use breathing apparatus for the purpose of fishing .
4. No person shall anchor or moor within the MBCA for the purpose of carrying out water sport activities, filming, and research or study tour save under a written permit issued and upon reasonable payment of prescribed fees.
5. No person shall, for any purpose whatsoever, remove corals from the study area, or undertake any act that may cause pollution within the MBCA.
6. No person shall, within the study area, camp for any purpose whatsoever. Camping areas for local fishing activities shall be designated by the MBCA Management Committee.
7. There are hereby imposed fees to be charged for different activities to be carried out within the Area.

4.5.3 Awareness of institution

Results indicate that the vast majority of the respondents were aware of the rules and regulations, thanks to regular awareness seminars and meetings to local leaders and village conservation committees. This leaves the remaining one-third of the respondents who are migrant fishermen to be not well-informed about the rules and regulations, hence, the possible cause of degradation. (Table 14).

Table 14: Percentage response on the awareness of Institutions

	Response (%) Village			
Awareness of Institution	**Unguja ukuu (n=-30)**	**Bungi (n=30)**	**Kisakasaka (n=30)**	**Kizimkazi (n=30)**	**Total (n=120)**
Respectful to rules and regulations	56.7	67.0	66.7	60.0	67.0
Do not have much information	43.3	33.0	33.3	40.0	33.0
Total	**100**	**100**	**100**	**100**	**100**

4.5.4 Informal traditional institution

Informal traditional institutions used in this study are traditional healing, rituals, sacred species and sites. Table 15 shows that the vast majority of respondents acknowledged the existence of the informal institutions in the study area, while only a negligible few denied that there were any such institutions. The same results were reported in the study by (Kamara, 1994). It was observed that 66.7% and 33.3% of respondent from Mwembeni-magoroto and Potwe-ndondondo respectively are aware of the existing rituals places in their area. Rituals practices were found to be contributing to the conservation of forest. For example of such rituals rules practiced at Mlinga forest reserve was: (i). One person could collect only one forest product in

one day. Collecting more than one product e.g. firewood and vegetables would cause someone to get lost in the forest (ii). No cultivation or tree cutting is allowed in the forest (iii). No activity apart from worshipping was permitted in ritual sites located in their area. The study also indicates that informal institutions play a key role in the preservation of indigenous knowledge which is a driving factor in the conservation of biodiversity in the study area. According to (Mbwambo, 2000), the internal sponsored institutions which are essentially traditional are important in natural resources management and play a greater role in regulating access and utilization of various natural resources in a given society. Traditional institutions represent the established local system of authority and other phenomena derived from the socio cultural and historical process of a given society (Appia-Opoku, 1999).

Table 15: Responses towards the existence of informal institutions in Menai Bay

Village	Responses on presence of Informal institutions					
	Yes		No		Total	
	n	%	n	%	n	%
Unguja ukuu	26	21.7	4	3.3	30	25
Bungi	28	23.3	2	1.7	30	25
Kisakasaka	30	25.0	0	0	30	25
Kizimkazi	27	22.5	3	2.5	30	25
Total	**111**	**92.5**	**9**	**7.5**	**120**	**100**

4.5.4.1 Traditional healer

Traditional healers have vast amount of knowledge of medicinal plants. The skill in traditional medicinal practices is acquired primarily through a long period of apprentice and observation passed from one generation to another. Traditional medicine plays an important role in the health of the residents of this study area, especially women who pay regular visits to traditional healers. Traditional healers

are viewed as especially important in treating fertility problems such as conception miscarriage and impotence for men. There exist mixed purposes with regard to visits to traditional healers in the study area in a situation whereby slightly less than half of the respondents accepted to be visiting traditional healers to cure diseases. While more than one-third acknowledged the fact that they visited traditional healers to solve their fertility problems, the remaining portion visit traditional healers for witchcrafts (Fig. 8).

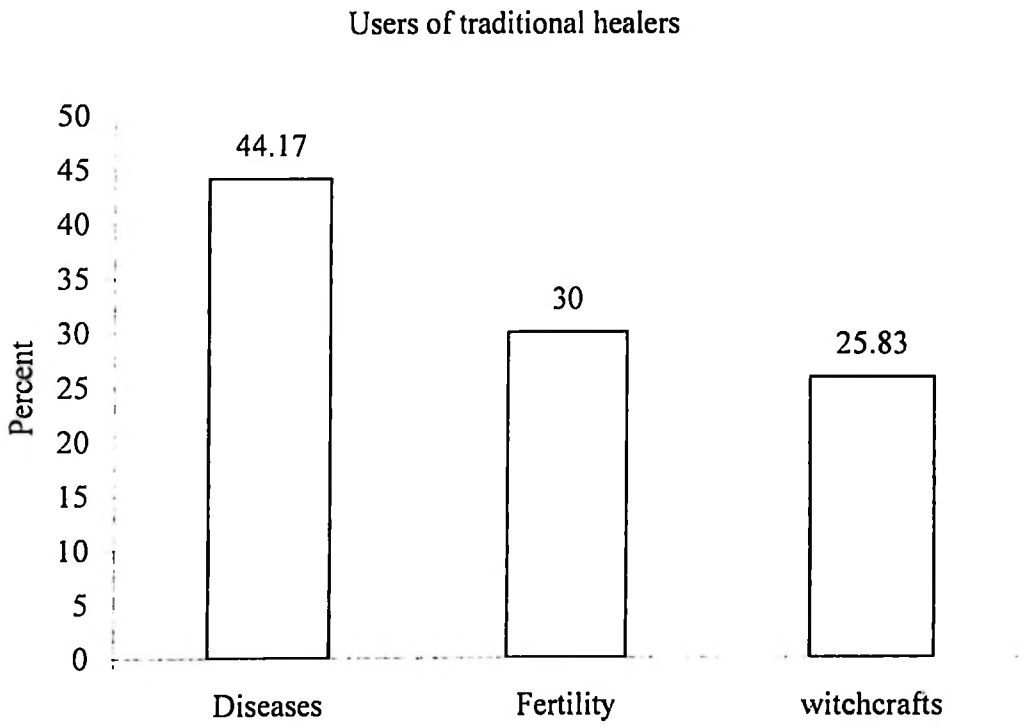

Figure 8: Response on the users of traditional healers

The study revealed that traditional healing as an institution plays an important role in the conservation of natural resources in Menai Bay's marine biodiversity. In FGDs a traditional healer said he actively took part in the organization of public meetings on the importance of conserving medicinal plants and sea grasses. He was quoted as

saying; *"I cure a number of diseases such as Kwashiorkor, stomach ache, fever and cough for children using the medicinal plants."* He would also use the roots of sea grass as a remedy for stings from different kinds of fish. Most traditional medicines derive from roots, leaves, and bark of plants. Other traditional treatments mentioned by healers include invocation of prayer, the power of the Qur'an, and the use of charms.

Study also revealed that traditional healers do not collect medicinal plant and sea grasses from the sea during low spring tides as was one of their temporary taboos. This has implication on natural resources conservation. The study done by (Odera, 2004) in Kenya has the same implication and indicates that sustainable use of medicinal plants through traditional healing as an institution has been facilitated in the past by several inadvertent or indirect local controls and some intentional traditional management strategies. Taboos, seasonal and social restriction on gathering medicinal plants and the nature of plant gathering equipments have contributed to limit medicinal plants harvesting to some degree. Other traditional healers reported that special prayers need to be said instead of using root and leaves of any plants. Same to (Mbwambo, 2000) that traditional healer claimed that special prayers need to be said before collecting roots of certain plants.

4.5.4.2 Sacred Sites and Rituals

Since sacred sites and ritual sites have common characteristics, it renders one difficult to distinguish between them. Sacred sites include cemeteries where people pray for fortunes while believing they would be helped by the spirit of the dead.

Experience from elsewhere in the country also showed that burial sites are kept at rich plantation areas, governed by local taboos banning deadwood collections from the graveyards .This justifies the belief that traditional institutions have their role and therefore influence decision-making on the use of natural resources in the study area. In Bungi village, it was learnt that 22.5% of respondents could acknowledge the presence of ritual sites called Kwabihole and Kichangaweni. About 30 % of respondents cited a number of ritual sites including Mfaume Omadi, Mkwajuwamini, Makime, Nyemebe forest and Fungu Yasini (sand bank) in Unguja Ukuu, while 31.7% of respondents said there were two ritual sites in Kisakasaka. They are called Mwana Mkuu and Pangakogwa (spring). Meanwhile, ritual activities are limited to the custodian of ritual leaders and people from Kisakasaka strictly without any alien involvement. This culture has implication to natural resources conservation as it drives the ritual sites into staying safe and not over used where intruders' involvement is regarded a taboo.

Meanwhile, the old mosque of Kizimkazi called *Msikiti wa Kizimkazi* as noted by about 16 % respondents was expressed as a ritual site as well (Table 16). Results from a similar study carried out by (Kamara, 1994) in the East Usambara were reported and concluded that the presence of traditional leaders, traditional taboos, sacred species and sites had active roles in conservation and utilization of forest and wildlife resources.

According to the key informants, various kinds of ritual practices are still on and going in the study area in the form of traditional worship in Swahili called *tambiko*.

They include praying for ancestors' blessings, fortunes and end of natural disasters such droughts and disease outbreak. One of the most conspicuous advantages of rituals is that they have remarkably contributed toward conservation of forest, ruins and sanctuaries in the study area. To ensure proper handling of the rituals, villagers nominate a respected man among the elderly *Mzee wa kijiji* to be a custodian in-change of all rituals. (IUCN, 2004) defined Custodian as individuals or groups of people, usually within traditional institutions, who have the responsibility to take care of a specific sacred natural site or sites. Custodians may reside either close to or at considerable distance from the sacred natural sites to which they are linked through history, culture, self identification and spiritual practice. A survey conducted by (IUCN, 2004) also revealed traditional institutions to have central role in forestry and other resources conservation. This is justified by both ritual leaders and villagers alike who are more careful in dealing with forests within a given ritual site rather than outside the ritual area. It is more likely for one to steal tree products from non-ritual forests than the opposite.

It is important to note that the necessary requisites followed during a ritual practice bring about positive implication to natural resource conservation, as people who wish to go for rituals have to carry with them sugarcane, sweats, banana and such kinds of products from a home garden that had apparently called for special preservation.

Table 16: Ritual sites found in MBCA

Rituals	Response (%) Village				
	Unguja Ukuu (n=30)	Bungi (n=30)	Kisakasaka (n=30)	Kizimkazi (n=30)	Total (n= 120)
Kwa Bihole and Kichangaweni	0.0	66.7	3.4	20.0	22.5
Mfaume Omadi, Mkwajuwamini, Makime, Nyemebe (forest)	93.3	10.0	3.3	13.3	30.0
Mwanamkuu, Pangakogwa (spring)	6.7	20.0	93.3	6.7	31.7
Msikiti wa Kizimkazi (old mosque)	0.0	3.3	0.0	60.0	15.8
Total	**100**	**100**	**100**	**100**	**100**

Figure 9: The once ritual site at Kizimkazi old mosque has now almost turned into tourist attraction

4.5.4.3 Sacred species

Several species are protected through restriction and prohibition from using them. These include dolphin, tortoise and puffer fish. A belief that eating from such kinds of specie could result into getting skin diseases, misfortunes and sometimes death, prevents people from catching them. The prevalence of these taboos in the study

area had active roles in the marine biodiversity conservation. The same results in which several animal species including *Reduncasp Nkulungu* and *Tragelaphus scriptus Pongo* were protected through restriction and prohibition from using them were reported in the study by (Kamara, 1994) in the East Usambara.

4.6 Factor Influencing IK and Institutions in the Study Area

Traditional institutions have been changing with time because of the effects of several external events and pressures. It is difficult to pinpoint exact causes and times of change, since it has generally been a gradual process by the interplay of several different factors. There are many different factors that may lead to short and long term changes of traditional institutions in resource management Campbell *et al.* (2000) argue that it is not clear yet which circumstances lead to breakdown of rules and being reinforced, but they speculate that the basic differences lie in nature, history, nature of the resource, for example; extent of use of resources and also economic value of product.

Results in table 17 show that nearly half of the respondents blamed spontaneous migration of people, especially those coming for *dago*, for the erosion of culture. Other culprits of the erosion were the people moving from the urban areas, who allegedly do not want to pay allegiance to traditional leaders because they consider the institutions as archaic. The fact that the area is inhabited by a relatively high number of newcomers (fishermen) exacerbates the situation. This influx not only affects the capacity of traditional leaders to mediate different interests and impose limitations on the use of natural resources by members of the community, but it also

tends to weaken their capacity and authority to exclude outside users, as newcomers have no reason or motivation to respect traditional institutions. In other worlds, the boundaries of the community become porous, resulting in almost unlimited entry for potential resources users. Results also show 45.8% of respondents acknowledge that modern education and religion are other factors that have influenced erosion of traditional institutions in the study area. A study by (Niamir, 1990) found out that modern education supported by schools, churches, and mosques has adversely affected the process to transfer knowledge from one generation to another. The government and missionary schools during the colonial period withdrew children from the society and hence weakened the intergenerational dialogue. Therefore, the current younger generations spend less time on the homeland and are less dependent on its resources, resulting into less opportunity to learn from their elders and less incentive to do so. The formal religious teachings prohibit worships in traditional ritual sites, apparently contributing to the erosion of traditional institutions. More and more knowledge is being lost as a result of the disruption of traditional channels of oral communication. Neither children nor adults spend as much time in their communities anymore. For example, most people travel to the city on a daily basis for schooling, for work, or for selling their farm products. Also most young people are no longer interested in, or do not have the opportunity to learn the traditional methods. It has become harder for the older generation to transmit their knowledge to young people. However, a very minute portion acknowledged that modern civilization was another factor that had influenced erosion of traditional institutions in the study area.

Table 17: Erosion of informal institutions

Reasons for erosion of informal institutions	Response (%) Village Unguja ukuu (n=30)	Bungi (n=30)	Kisakasaka (n=30)	Kizimkazi (n=30)	Total (n=120)
Modern education and religion	53.3	43.3	46.7	40.0	45.8
immigration	46.7	53.3	43.3	43.3	46.7
Civilization	0.0	3.4	10.0	16.7	7.5
Total	**100**	**100**	**100**	**100**	**100**

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The study has shown that IK have active roles in conserving the marine biodiversity. Also study come out with fact that indigenous knowledge is useful for biodiversity conservation and promotes sustainable practices. It is truly examines the inherited indigenous knowledge such as denoting traps by considering marks and sign on the sea, use of local and hand crafts gears like baskets. wooden weapons and follow lunar calendar which goes hand in hand by nature is essential for sustainable practices and marine use. Marine knowledge is found to be useful in identifying and locating resources and that sustainable practices ensured continuity of these resources.

As indicated earlier in the objective two, extent of the use of IK focuses on the use of marine species, amount of fishermen per season and use of indigenous fishing methods. It is the Monsoon winds that determine the use of indigenous knowledge in marine biodiversity due to the winds' seasonal variation. The seasonal variation also determines changes in the nature of occupation of the indigenous people as the low season or the end of *bamvua* prompt them into resorting to alternative activities that are not related to fishing, hence preserving the marine biodiversity. On the other hand, the winds provide for regulatory system over seasonal flow of fishermen to specific fishing sites and specific catches, apparently controlling the trend of biodiversity conservation. Though the indigenous fishing methods mostly used by the fishermen in the study area have been found to be more convenient for

biodiversity conservation, the concerned fishermen expressed preference for alternative modern gear for deep sea fishing in order not to disturb marine diversity at their localities.

The study concludes that indigenous knowledge promotes biodiversity conservation in many ways and that indigenous education acquired through formal and informal traditional institutions is equally essential in maintaining indigenous knowledge. It showed that Indigenous education through informal institutions such as Traditional healers, Ritual sites and sacred sites use a variety of local teaching and learning approaches that utilize the environment as a tool and that learning venues provide a real experience. Institutions and existing laws for the documentation and dissemination of local indigenous knowledge and practices rarely exist. The findings also revealed formal and informal traditional institutions were useful as they were providing indigenous environmental education to the community. However, the indigenous knowledge was not documented. The indigenous education is flexible, holistic and informal in nature and uses mostly oral history through verbal instruction and various non-verbal means.

It has been found out that it is modern education and religion, migration trend and civilization which bring about short and long-term changes of traditional institutions in conservation of natural resources management in the study area. Given the research results, migration plays the biggest role in bringing about these changes, both positively and negatively. It has been realized that when the locals go out fishing in *dago* they tend to preserve the local marine biodiversity at home, but when

other migratory fishermen come instead they are most unlikely to adhere to the preservation of informal rules, thus causing a negative environmental impact.

It has also been found out that religious values are antagonistic with the use of the informal institutions and indigenous knowledge and practices. Therefore, the emergence of an overwhelming high number of religious believers among the modern generations has brought about the decline of the indigenous knowledge, its practice and erosion of traditional institutions.

There is a need for MBCA to develop common IK cues used in defining fishing scheduling and location of fishing grounds. For the reason that it minimise conflicts in best fishing areas example in spawing areas, feeding areas and immigration roots.

5.2 RECOMMENDATION

The study suggests that conservation planners should focus their attention on the already existing local informal institutions (traditional fishing, ritual sites and sacred sites) for partnership strategies. The study also suggests that conservation and management of MBCA and all other natural ecosystems should involve everybody, especially local people who are considered to be part of the problem and also potentially part of the solution.

It is recommended that the data from this research have made it possible to do analysis which has given an insight into the identification of indigenous knowledge.

practices and traditional institutions related to environmental conservation and management of marine and coastal resources in MBCA with the view to extract valuable practices that shall be harmonized with government conservation measures However, a lot remains to be done to better understand on all factors affecting indigenous knowledge and conservation. The following are recommended for further research.

There is a need to cover large samples of each socio-economic grouping in order to determine the identification of indigenous knowledge. This study drew a sample from majority of men and only three women in household questionnaire, and sixteen women. Further research is needed to include women.

REFERENCES

Acerbi, A. and Parisi, D. (2006). Cultural Transmission Between and WithinGenerations. *Artificial Societies and Social Simulation Journal* 9: 19 - 57.

Agrawal, A., (1995). Indigenous and scientific knowledge: Some critical comments. *Indigenous Knowledge and Development Monitor Journal* 3 (3) : 3 - 6.

Arntzen, J.W., Molokomme, D.L., Terry, E.M., Moleele, N., Tshosa, O., and Mazambani, D. (2003). Community-based natural resource review in Botswana: Community-based tourism ventures, benefits and challenges. *Journal of Botswana Tourism Management* 31: 136 - 146.

Appiah-Opoku, S. (1999). Indigenous economic institutions and ecological knowledge: A Ghanaian case study. *Journal of Environmentalist* 19 : 17 - 122.

Banuri, T. and Apffel M. F. (1993). *A Systems-of-Knowledge Analysis of Deforestation.* The United Nations University Zed Books, Ltd., London. pp 1 - 23.

Barbier, E.B., Burgess, J. and Folke, C. (1994). *The Ecological Economics of Biodiversity.* Earthscan Ltd. London. 267pp.

Beattie, A. J. and R. A. Bradstock. (Eds.) (1995). *Conserving Biodiversity: Threats and Solutions*. Surrey and Beatty & Sons Ltd. Australia. pp 3 - 10.

Berkes, F. (1989). Local-level management and the commons problem: A comparative study of Turkish coastal fisheries. *Journal of Marine Policy 10*: 215 - 229.

Briggs, J. (2005). The use of Indigenous knowledge in development: Problems and Challenges. *Progress in Development Studies Journal* 5 (2): 99 - 114.

Brokensha, D., Warren, D.M., Werner, O. (1980). *Indigenous knowledge systems and development*. University Press of America, Lanham. pp 111 - 128.

Brundtland, G. H. (1987). *Our Common Future, World Commission on Environment and Development*. Intermediate Technology publications., Oxford. 48pp.

Campbell, B., Frost,P..A., Standa-Gunda, W., Mukamuri,B . and Veeman, M. (2000). A conceptual model of woodland use and change in Zimbabwe. *International Tree Crops Journal* 10: 347 - 366.

Cunningham, A.B. (1995). *Biodiversity and the Ecosystem Approach in Agriculture, Forestry and Fisheries*. Earthscan Publications Ltd., London. 13pp.

Department of Fisheries and Marine Resources Zanzibar (2005). *Rapid Assessment of Menai Bay Conservation Area in Zanzibar*. Annual Report. Zanzibar government press.Zanzibar. 19pp.

Dladla. Y (1995). *An appreciation of South Africa's newly emerging conservation policy.* Proceedings of SADC Workshop, Lilongwe, Malawi, 27 June, 1990. 209 - 213pp.

Fisher, (1993). Creating space: Development Agencies and Local Institutions by Natural Resources Management. *Peoples, Trees and Forests Journal* 22: 4 - 25.

Food and Agricultural Organization. (2001). *Harder Decision Making in Natural Resources Management in Arid and Semiarid Africa*. Rome, Italy., 185pp.

Gadgil, M. and Berkes, F. (1991). Traditional resource management systems. *Resource Management and Optimization Journal 18* : 127 - 141.

Harding. G.R, McCay, B.J. and Acheson, B. (Eds.) (1987*). The tragedy of the commons: The Culture and Ecology of Communal Resources.* University of Arizona Press, Tucson. 162pp.

Hasan.L. (2000). Property Regimes in Resource Conservation. Pakistan Institute of Development Economics, Islamabad. 12pp.

Holling, C.S. and Bocking, S. (1990). Surprise and Opportunity: Evolution in Ecosystems, in Society. *Journal of planet under stress* 30: 120 - 222.

IUCN (2004). The World Heritage List: Future priorities for a credible and complete list of natural and mixed sites. *Journal of the World Conservation Union* 1 - 17.

Jiddawi, N.S. and Stanley, R.D. (1999). *A study of the artisanal fishery landings in the villages of Matemwe and Mkokotoni, Zanzibar. In: Proceeding of Workshop on the Artisanal Fisheries Sector, Zanzibar.* (Edited by Marcus C. Ohman), 22 -24 September 1997, Zanzibar, Tanzania. pp 1 - 10.

Jiddawi N.S. and Ohman M.C. (2001). Marine fisheries in Tanzania: *Journal of Present State of Marine Science* 31: 518 - 527.

Jiddawi N.S., Yahya S., and Hamadi K. (2002). Monitoring of the artisanal fisheriesin four fishing villages. *Journal of estimating fishery statistics* 19 - 33.

Johannes, R. E., Ruddle, K.., and Hviding, E. (1992). Marine resources management in the Pacific Basin: *Anthology Journal* 30: 22 - 120.

Kamara, B.A. (1994). *Indigenous knowledge: A necessary asset in the conservation of biological resource in Tanzania.* In: *Proceedings of a National Conference held at the Institute of continuing education.* (Edited by Rutatora, D.F. Kajembe, G.C. and Neke, S.M.). 15 – 16 September 1994, Morogoro, Tanzania. pp 8 - 16.

Katani, J. Z. (1999). Coping strategies against deforestation at Mwanza District. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania 110pp.

Kombo, D. K . and Tromp, D. L. (2006). *Proposal and Thesis Writing.* Paulines Publication, Nairobi. 168 pp.

Lamola, L. M. (1992). *Linking the formal and informal sectors in plant genetic resources conservation and utilization.* Agricultural Law Center Ltd., Drake University Law School. 92pp.

Levine, A. (2004). *Local response to marine Conservation in Zanzibar, Tanzania.* Centre for African Studies Ltd., Africa, University of California, Berkeley. 19pp.

Makame, K. (2000) Mangrove management and Conservation. Special Project Report. For award Sokoine University of Agriculture. pp 53.

MA NREC. (2005a). Rapid Assessment of the Proposed Menai Bay Conservation Area. Annual Report. Government Printer. Zanzibar. pp 1 - 83.

MANREC. (2005b). Rapid Assessment of the Proposed Pemba Channel Conservation Area. Annual Report. Government Printer. Zanzibar. pp 41.

Mbwambo, J. S. (2007). Agro biodiversity and food security among small holder Farmers in Uluguru mountains, Tanzania. Thesis for Award of PhD Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 223pp.

Mbwambo, J.S. (2000). The Role of Local Knowledge and Organizations in sustainable Conservation of Biodiversity. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro,Tanzania 110pp.

McCorkle, C. and McClure, G. (Eds.) (1992). *Indigenous Knowledge Systems and Cultural Dimension of Development*. London Kegan Paul International Press, London. 111pp.

Murphee M. W. (1994). The role of institutions in community based conservation. *Journal of Local Institutions and Management* 30: 427.

Mwagiru, W., Thomas-Slayter, B.P., Ford, R. (1989). An introduction to participatory rural appraisal for rural resources management *Journal of International Development Programme* 11: 265.

National Research Council (1991). *A Plan for Collaborative Research on Agriculture and Natural Resource Management*. National Academy Press Washington. D.C. 164pp.

Ngouffo . N and Benjamin, T. (2001). *Culture and sustainable Management of Natural Resources in Africa.* Proceedings of International Conference on the Cultural Approach to Development in Africa. Dakar, Senegal, 10 - 14 December, 2001. 222pp.

Niamir, M. (1990). Herder's decision-making in natural resources management in arid and semi-arid Africa. *Journal of Community Forestry* 20: 159 - 176.

North, D. C. (1994). Economic performance through time. *American Economic Journal* 84(3): 359 - 368.

Ntiamou-Baidu, Y. (1995). *Indigenous versus introduced Biodiversity conservation strategies*. Proceedings of Ghana Biodiversity Series Workshop, Accra, Ghana, 11May, 1995. 1 - 11pp.

Odera, K. (2004). Community based enterprises. The role in sustainable natural resources management and rural livelihood in Zimbabwe. In: *Proceedings for the tenth biennial conference of the international association for the study of common property*. 9 - 13 August 2004,Oacaca, Mexico. 20pp.

O'Riordan, T. and Stoll-Kleemann, S. (Eds.) (2002). *Biodiversity, sustainability, and human communities. Protecting beyond the protected.* Cambridge University Press., Cambridge. 36pp.

Ostrom, E. (1990). *Governing the Commons.* Cambridge University Press., Cambridge. 58pp.

Ostrom, E., Walker, J. and Gardner, R. (1992). Covenants with and without a sword: self governances possible. *American Political Science Journal* 86: 404 - 417.

Painter, M. (1995). *An approach for monitoring and evaluating community based natural resource management.* Proceedings of Department of Wildlife and National Parks Workshop, Gaborone, Botswana, 16 November, 2008. 202pp.

Pocey, D. A.(1985). Management of Tropical Forest Ecosystems: The Case of the Kayapo Indians of the Brazilian Amazon. *Journal of Agro forestry Systems* 3 (2): 139 - 158.

Titilola, S. Oguntunji (1990). The Economics of Incorporating Indigenous Knowledge systems into Agricultural Development. *Agricultural Ecosystems and Environment Journal* 63: 1 - 16.

Tobisson, E., Anderson, J., Ngazi, Z., Rydberg, L. (1998) Tides, Mansoons and Seabed. *Journal of Local knowledge and practice in Chaka Bay, Zanzibar* (8): 677 - 685.

Torell, E.,Avitii.,M and Karen, P., (Eds.) (2006). *Menai Bay Governance Baseline: Coastal Resources Center*. University of Rhode Island Press. 18pp.

Warren, D.M., Slikkerveer, L.J., Brokensha, D. (1994). *Indigenous Knowledge Systems*. Zed Books Ltd., London. 55pp.

Warren, D .M. and Slikkerveer, L. (Eds.) (1991). *The Impact of Nineteenth Century Social Science in Establishing Negative Values and Attitudes towards Indigenous Knowledge Systems: Implications for Agriculture and International Development*. Lowa State University Press. Lowa State. 183pp.

Williams, A. Masoud, T.S. and Othman, W.J., (1998). *Community based conservation: Experiences from Zanzibar. Sustainable Agricultural Programme*. International Institute for Environment and Development Press, London. 123 – 132pp.

WWF, (2001).. *Eastern Afrian Marine Ecoregion*. Proceedings of the WWF Visioning Workshop, Mombasa, Kenya, 21 24 April 2001. 1 - 36pp.

Zanzibar Revolutionary Government (1992). *National Environmental Policy for Zanzibar*. Zanzibar Government printer. Zanzibar. 14pp

APPENDICE

Appendix 1: Structured Questionnaire

Questionnaire Number
A. PERSONAL PARTICULARS

DATE OF INTERVIEW	VILLAGE/ WARD NAMES	DIVISION
HOUSE HOLD CODE	NAME	ETHNICITY
RESPONDENT'S AGE years	RESPONDENT'S GENDER	
	1= Male 2= Female	
AGE OF HH (years)	GENDER OF HH	ORIGIN OF HHH
1) less than 55 years 2) 18-35 years 3) 36-55 years 4) Above 55 years	1) = Male 2) = Female	1)= Native 2) = Immigrant
MARITAL STATUS	1) Single 2) married 3) divorced 4) separate	
TYPE OF MARRIAGE	1) monogamy 2) polygamy	

Members of HH currently resident

Name	Age year	Sex		Relationship		Education		Occupation	
1		1=male 2=female		1)= Head 2)= Wife 3)=Husband 4)=Child 5)= Others		1)= none 2)=std IV 3)=std VII 4) secondary 5)=higher education 6)= others		1)= student 2)=Farmer 3)=Fishing 4)=Farming 5)=fishing And farming 6)= business 7)C/servant (specify)	
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
Total resident HH members									

B. INDIGENOUS KNOWLEDGE AND PRACTICE

3) Is there any cultural values that marine and coastal offer?

1) Yes
2) No ☐

3b) If yes, what are they?

S/N	Cultural values	Users (Men, women, Young people, Children)
1		
2		
3		
4		
5		

4a) Is there any ritual site in MBCA?

1) Yes
2) No ☐

4b) If yes, what are they called in your local language? .....

4c) If yes, how are they used? .....

4d) If yes, are there ritual sites linked with conservation?

1) Yes
2) No ☐

4e) If yes explain how? .....

5) How do you get access on that ritual site? .....

6) What are the main activities done on the ritual sites?

1) Worshiping shrine
2) Sacrifice ☐

3) Fetch traditional medicine and worship shrine

4) Others (Specify)

7a) Are there any Indigenous practices associated with conservation and management of MBCA?

1) Yes ☐

2) No

7b) if yes. explain them.....

7c) If no explain what else is used for conservation and management of MBCA.

C FACTORS INFLUENCING INDIGENOUS KNOWLEDGE

9a) Do you use Indigenous Knowledge in your daily activities?

1) Yes ☐

2) No

9b) If yes. show the activities and practices

1) IK in fishing

2) IK in farming ☐

3) IK in treatment

4) IK for domestic uses

9c) If no. what do you think made you not to use Indigenous Knowledge.

.....

10) Are the people in this village using traditional knowledge in their daily activities?

1) Yes ☐

2) No

10b) If yes indicate the activities

1) IK in fishing

2) IK in farming

3) IK in treatment

4) IK for domestic uses

10c) If no why do not they use them?

.....

11) What do you think are factor contribute to community failure to use indigenous Knowledge?

.....

.....

D. TRADITIONAL INSTITUTIONS

12a) Are there any traditional rule / regulation controlling access to MBCA?

1) Yes
2) No

12b) if yes what are they?

.....

12c) if yes, what happen when they are broken?

.....

13a) Do you know *dago*? (Fishing camp).

13b) If yes, where is it located in this village? .....

13c) if yes who sets the location of *dago*? .....

13d) if yes, what are the rule and regulation involved in the *dago*?

.....

14) What happens when a person breaks the rule?

.....

15) How many times of the year do you set *dago*?

.....

16) How many people participate per season per *dago* ?.....

17) Are there any gender balance or relation in *dago*?.....

18) What are the role of men during *dago*?.....

19) What happen to the *dago* after it is closed?

.....

20) Do you return to the same place every year?
1) Yes
2) No ☐

20b) If yes. why .....
20c) If no why.....
21a) Are there informal institutions which used to exist and which now are none existed?
1) yes
2) No ☐

21b) If yes what are they and what were their role play in MBCA?

S/N	Informal institutions	Roles

D. USE OF INDIGENOUS KNOWLEDGE

22a) Do you know *bamvua*?

1) Yes
2) No ☐

22 b) If yes, please explain .....

23) Do you practice *bamvua* ?

.....

24) What is the importance of *bamvua* ? .....

25) How long in *bamvua* ?.....

26) What determine the duration of *bamvua*?.....

27) Please indicate rules and regulation associated with *bamvua* ?

.....

28) What happens when one break the rules?

.....

29a) are there any rituals related to *bamvua*?

1) Yes

2) No ☐

29b) If yes, what are they? .....

30) In your opinion what are the useful aspects of *bamvua* in relation to conservation and management of MBCA? .....

31) How do *bamvua* relate to conservation and management of MBCA?

.....

32) What is the practical knowledge with *bamvua*?

.....

33a) Are there any indigenous practices apart from *bamvua*, which existed in the past and no longer practiced today?

33b) what are reasons for those practices to disappear?

1) Immigration and death
2) New generation doesn't care ☐
3) Educated people does not care
4) Other (specify)

34) Who participate in *bamvua*?

1) Males
2) Females ☐
3) Males, Females, children
4) Other specifies

E: BIODIVERSITY

35) Where do you fish?
a) Along the coast
b) At the islets
c) At the boundaries
e) Other specify

36) Which places do you prefer to fish?
a) Along the coast
b) At the islets
c) At the Islet where you can find shrine.
e) Other specify

37) What is the main species do you fish?

.....

38) Please indicate methods of fishing for species mentioned

.....

39a) Are there any traditional methods of fishing practiced by this household ?

1) Yes

2) No

39b) if yes, show types of practices used for fishing by this household

.....

40a) Do you know traditional fishing practices used in the past?
1) Yes
2) No

40b) If yes, mention them .....

40c) If no, explain the reason for disappearance

.....

41a) Is there any particular season of the year for fishing

a) Monsoon wind.

b) At the beginning of the year

c) At the end of the year

e) Other (specify)

41b) Mention the reason

a) To harvest more fish

b) Traditional way of fishing

c) Way of conservation.

d) Other specify

42a) Are there any rules, norms or customs used in fishing?

1) Yes

2) No

42b) if yes, what are they?

.....

43) in your opinion, what is the extent of their use indigenous knowledge in the community ?

.....

44) Are there any traditional practices used in fishing?

.....

45) How do you benefits with conservation efforts of this area?

.....

CHECK LIST FOR KEY INFORMANT

MBCA MANAGERS

1. Types of Indigenous knowledge of various biodiversity conservation
2. Types of indigenous practices employed in MBCA
3. Important and weaknesses of the practices
4. The extent and use of useful indigenous practices for conservation of MBCA
5. Traditional institutions for conservation and management of MBCA
6. Factors influencing indigenous knowledge and institutions in the study area.
7. Problems in implementing conservation practices?
8. Support that MBCA receives in maintaining the conservation practices apart from the Fisheries Department?

VILLLAGE LEADERS

1. Awareness of the importance of the MBCA
2. Conservation activities encourage Conservation
3. Description and importance of *dago* and *bamvua*
4. Kind of fishing gear are allowed
5. Kind of species are not allowed to fish
6. Local leaders understanding Management rules and regulations.
7 Village leaders participation in local institution

QUESTIONNAIRE FOR FDG (checklist)

1) Is there any cultural values that marine and coastal offer?
2) Is there any ritual site in MBCA?
3) What are they called in your local language?
4) If yes, how are they used?
5) If yes, are there ritual sites linked with conservation?
6) How do you get access on that ritual site?
7) What are the main activities done on the ritual sites?

8) Do you use Indigenous Knowledge in your daily activities?

9) Indicate the traditional activities and practices?

10) Are there any Indigenous practices associated with conservation and management of MBCA?

11) What do you think are factor contribute to community failure to use indigenous Knowledge?

12) Are there any traditional rule / regulation controlling access to MBCA?

13) What happen when they are broken?

14) Do you know *dago*? (Fishing camp).

15) If yes, where is it located in this village?

16) If yes who sets the location of *dago*?

17) If yes, what are the rule and regulation involved in the *dago*?

18) What happens when a person breaks the rule?

19) How many times of the year do you set *dago*?

20) How many people participate per season per *dago*?

22) Are there any gender balance or relation in *dago*?

21) What are the roles of men during *dago*?

22) What happen to the *dago* after it is closed?

24) Do you return to the same place every year?

25) Are there informal institutions which used to exist and which now are none existed?

26) If yes what are they and what were their roles plays in MBCA?

27) Do you know *bamvua*?

28) Do you practice *bamvua*?

29) What is the importance of *bamvua*?

30) How long in *bamvua*?

31) What determine the duration of *bamvua*?

32) Please indicate rules and regulation associated with *bamvua*?

33) What happens when one break the rules?

34) Are there any rituals related to *bamvua*?

35) In your opinion what are the useful aspects of *bamvua* in relation to conservation and management of MBCA?

36) How do *bamvua* relate to conservation and management of MBCA?

37) What is the practical knowledge with *bamvua*?

38) Are there any indigenous practices apart from *bamvua*, which existed in the past and no longer practiced today?

39) What are reasons for those practices to disappear?

40) Who participate in *bamvua*?

41) Where do you fish?

42) Which places do you prefer to fish?

42) What is the main species do you fish?

43) Are there any traditional methods of fishing practiced by this household?

44) Is there any particular season of the year for fishing?

45) Are there any rules, norms or customs used in fishing?

46) In your opinion, what is the extent of their use indigenous knowledge in the community?

47) Are there any traditional practices used in fishing?

48) How do you benefits with conservation efforts of this area?