INDIGENOUS KNOWLEDGE AND MANAGEMENT SYSTEMS FOR MARINE RESOURCES AMONG THE GIRIAMA OF NORTH COASTAL KENYA

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Declaration

This thesis is my original work and has not presented for a degree in any other university.

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This thesis has been submitted for examination with our approval as the University Supervisors

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Dedication

This thesis is dedicated to my parents, the late Alfonse Shilabukha Khamati and the late Martha Khakayi Muteshi-Shilabukha for introducing me to the world of learning. I also remember my brother the late George Khamati Imbayi for the encouragement to pursue post-graduate studies, and sister, the late Modesta Mikhako. Being her immediate follower, she left an indelible impression on me on the importance of academic excellence. Much as they are gone, their collective inspiration, encouragement and wisdom have left a permanent mark on my academic life that I deeply appreciate.

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CHAPTER ONE
BACKGROUND TO THE STUDY

1.1 Introduction

For millennia, humans have cohabited with wildlife and this has happened, to a large extent, in harmony. However, the uses of natural resources and population pressures combined with socio-economic development have been changing the scenario all over the world, and nowhere more than regions inhabited by indigenous communities (Barrow, 1998; Jackson *et al.* 2001; De Juan and Lleonart, 2010). To counter the effects of population pressure and socio-economic development, many countries have adopted the protected area approach in the management of natural resources. Therefore, at national levels, natural resources can be an important source of employment and the attendant income from wages and taxation. At the local level these resources play a less direct role as the local communities are expected to play a hands-off role as they witness the benefits of conservation going to outsiders (Barrow, 1998).

This approach seeks to enhance the biological and ecological integrity of the resources through restriction of marine and terrestrial human activities in the forests or parks (Barrow and Murphree, 1998; De Juan and Lleonart, 2010). The implication here is that the government determines the types and levels of use and benefits that can accrue, by whom and under what circumstances. Communities living in close proximity to the resources are not allowed to harvest the resources freely because they are seen as agents of interference and destruction, which is considered detrimental to the smooth-functioning and the regeneration of the resources in protected ecosystem (Ostrom, 1990). In this way, natural resources are reduced to tools of leisure and income for development purposes, mostly benefitting outsiders.

These scientific policies and approaches emerged at a time of fierce prejudice against indigenous peoples and led to the worldwide acceptance of a model of "colonial conservation" which has caused, and continues to cause, widespread alienation of indigenous groups from resources which they have exploited for millennia sustainably (Harries-Jones, 1992:161). These policies and approaches are based on the need to separate the natural world from the human world, while indigenous people view nature from the perspective of inter-connected relationships.

This brings us to the debate about the relation between humans and nature; the debate underpins the discourse on the relevance of indigenous knowledge and management systems in the contemporary world. One side of this debate presupposes that there is a distinction between human society and nature. This side of the debate has inspired the scientific and protection approach of natural resource management (Clifton, 2003; Badalamenti *et al.* 2000). This side of the debate has been used in the past by anthropologists and others to mark out the gap between human and non-human worlds, domains and spheres.

However, this has led to the (often) rapacious perception that nature is alien and, therefore, inimical to human comfort, progress and economic advancement. This can be attributed to the Victorian era when Western interests centred on the conquest, study and civilisation of the "primitive and other" peoples (Willis, 1990:6). Thus, the primary visual image of stark "otherness" has encouraged the increasingly urban, westernised and industrial human society to perceive nature as alien, something to be conquered and domesticated to facilitate human comfort and progress. We, therefore, still have the belief, like the Victorians did, that nature is primitive (totemic) and, therefore, backward. We also still, to a large extent, think that nature is antagonistic and intimidating to human society. At the same time, the thread of belief that runs counter to cohabiting and connecting with nature is that natural resources have an economic value, which is invariably calibrated and determined along anthropocentric and dualistic lines (Harries-Jones, 1992:159).

On the other side of the debate, the thinking is that people's concept of nature should be dialectical and holistic as opposed to dualistic. This philosophy is in conformity with many an indigenous people's view of nature (Willis, 1990:4; WGIP, 2001), and is the basis of indigenous peoples and indigenous knowledge. The term indigenous peoples can be used to describe any ethnic group of people who inhabit a geographic region with which they have the earliest known historical connection, alongside more recent immigrants who have populated the region and, may be, greater in number. The Giriama people, among whom this study was done, fit the description of indigenous people. This is especially so if we consider their knowledge and relationship with the marine resources (A detailed ethnography of the Giriama is presented in Chapter Three).

Advances in human rights and in the thinking of conservationists in addition to expanding anthropological research into natural resource management, have led to an acceptance that conservation can and must be achieved in collaboration with indigenous peoples and should be based on respect for their internationally recognised rights (Ostrom, 1990). However, in many instances in the African context in general and Kenya in particular, the protected areas approach continues to be imposed according to the colonial model, calling into question the extent to which there is a real commitment to giving conservation a human and, therefore, indigenous cultural dimension (Ostrom, 1990; Hobbs, 2003).

Therefore, for conservation to be sustainable and successful, efforts must be put in place to recognise the input of the local resource users most affected by conservation activities and who bear the costs of lost livelihoods, access and damage (Dudley, 2008). This is because a number of studies have demonstrated that for conservation to pay, it has to be seen, not only in financial and economic terms, but also in terms of more qualitative cultural values (Ostrom, 1990; Barrow *et al.* 1995; Hobbs, 2003). This may explain the increasing acceptance of indigenous conservation efforts around the world. Indigenous management of resources presents a broad spectrum of new management arrangements and benefits that enhance the conservation of the resources themselves as well as the local communities, through their indigenous knowledge.

The use of indigenous knowledge in the conservation of natural resources has been undertaken around the world in different ways and at different speeds. South-east Asia is one region which has embraced indigenous conservation of coastal area resources, including marine resources (Thiang-Eng, 1998; de la Torre-Castro and Lindström, 2010). There are six programmes under ASEAN/US CRM initiatives. The primary objective the initiatives was not only to tap into the indigenous knowledge of the communities in the island states of the Philippines, Sri Lanka, Indonesia, Malaysia and Singapore in the management of marine resources but also to raise awareness on the importance of the resources.

In East Africa, the management of marine resources largely encompasses the administrative, legislative, social and technical measures involved in the conservation and use of wildlife and wildlife products (Semesi, 1998; de la Torre-Castro and Lindström,

2010). Therefore, the concept of sustainable use entails controlled harvest of economic products while at the same time maintaining the ecosystem in as natural, or close to its original pristine state as possible.

However, the complexity of managing marine resources in Kenya makes attempts to manage them extremely challenging. For example, legislation relating to mangroves has generally been included in that for terrestrial forestry (Semesi, 1998). The same applies to fisheries where parts of the sea are marked as marine parks or marine reserves. The story is replicated in other parts of the region such as Madagascar, Mauritius and Mozambique. However, there is no information on marine resources management in Somalia, and so, it is not possible to comment on efforts in that country (Semesi, 1998; UNESCO, 2005). Most of the natural resources management planning in the region does not look at the wider socio-economic implications of marine resources management. The essential role of the marine resources in supplying the basic of the coastal communities or their important value to the environment, including their indigenous management systems, is usually downplayed, if not ignored completely (Tobisson, 2014).

This brings us to the gist of this study, namely, the role of indigenous knowledge in the management of marine resources among the Giriama people of coastal Kenya. It is noteworthy that the management of marine resources, including mangroves and fisheries, has been receiving special media and public opinion attention. This is because natural resources, including marine resources, form a special aspect of coastal resources. Although customary tenure systems for the management of local marine resources occur throughout the world, they remain relatively little known (Larsen, 2009:11). Thus, this study was based on the premise that interest in indigenous knowledge in the management of marine resources should be seen in the wider context of international economic and trade and development policies (Warren, 1992:5; Larsen, 2009:26). This study was also premised on the idea that much of pragmatic science itself has antecedents in indigenous cosmology on disease, nature, health and natural resources use.

This study postulates that for the management of these resources, Giriama indigenous knowledge is important in a number of ways. First, local ecological knowledge concerning the reef, mangroves and fisheries can contribute to the scientific

understanding of this complex ecological system. Second, an understanding of Giriama indigenous knowledge systems can facilitate interactions between local experts and outsiders. Furthermore, knowledge of Giriama belief systems concerning human relations with natural resources may help explain and predict reactions to management efforts. This has already happened in a number of locations around the world, for instance, Sri Lanka, Mexico and the Philippines (Pollnac, 1998:9; Feidi, 2005).

Because of social differentiation and division of labour, Giriama ecological experts, like those found in most indigenous societies, play a significant role in managing the diversity of the ecosystem, since they are responsible for sustaining livelihoods and foretelling any climatic dynamics for a society (Shiva, 1993; Bunning and Hill, 1996:5). As such, the Giriama have developed multiple strategies for maintaining their ecological systems and other livelihoods, almost all of which are based on a sophisticated management system of genetic diversity. This study was undertaken in the area between Kisauni in Mombasa County and Matsangoni in Kilifi County, Kenya.

1.2 Problem statement

Biodiversity, the totality of genetic resources, varieties and ecosystems, is the very foundation of life on earth. Different regions of the world are endowed with different species of plant, animal and micro-organism species. The spatial distribution of these species is dependent upon climatic and topographic influences and dynamics (Crona, 2006). Most of the "epi-centres of genetic diversity" are located in the South and these regions are, however, threatened with the loss of the important bio-diversity and genetic resources due to a number of dynamics (Zavarin, 1991:252; Larsen, 2009:20). One of these factors is the focus on the so-called scientific methods of managing biodiversity, to the exclusion of indigenous approaches. The assumption has been that the scientific methods are superior to the time-tested indigenous knowledge systems. This may explain why development interventions have a long history of downplaying or even ignoring locally based knowledge.

As a result, the imposed frameworks and strategies for resource management are often alien to local conditions and ineffective in the long-term (Dale *et al.* 2000; Olsson and Folke 2001). Therefore, natural resources management initiatives has often been based on

incorrect assumptions, resulting in culturally inappropriate actions through top-down planning (Berkes, 1993; Hobart, 1993; Tobisson, 2014). In addition, the equilibrium that is requisite for the sustainable local level use of natural resources to facilitate an enhanced quality of life is difficult to find and maintain because indigenous knowledge, particularly in the African context, has long been ignored and maligned by outsiders.

There is need for development policies and programmes as well as academic and action research initiatives to demonstrate interest in indigenous knowledge of the environment and natural resource management. This may be the reason for the shift towards what Berkes (1993:7) aptly calls 'alternative collective wisdom'. This collective wisdom is based on local ecological knowledge, and has, over the years, become more refined and is now becoming more influential in policy documents, research agenda and participatory methodologies. However, despite the best intentions behind the impetus for the recognition of this indigenous knowledge in natural resources management, there is still dissatisfaction with many of the efforts (Tobisson, 2014). Very little is being used of this knowledge in the management of ecosystems in the developing world in general, and marine resources in particular.

The reason is that there appears to be a significant gap in comprehension between two different worldviews, one "scientific" and the other "cultural". To close this chasm, there is necessity for what Hornborg (1994:251) refers to as a 'conceptual symbiosis' to occur among all the players involved in natural resource management. This symbiosis will lead to a new and more comprehensive understanding of indigenous ecological knowledge in its specific context of use in regard to natural resources management (Dale *et al.* 2000; Olsson and Folke, 2001). For this to occur, there is need to recognise indigenous ecological knowledge. This will go beyond the imposition of one worldview upon another and which, instead, will integrate epistemological differences of scientific approach to natural resources management and indigenous approaches (Kolawole and Laogun, 2005).

Thus, the present study postulates that there is a relationship between the presence and use of indigenous knowledge and the suitable use and management of the marine resource among many people around the world. This study was, therefore, designed to find answers to the following questions:

1. How does the Giriama indigenous system of practices (experienced events), belief, and context (CPB) provide an epistemological basis for the understanding of indigenous ecological knowledge in managing marine resources?
2. What is the structure, significance and role of the Giriama nomenclature as an operational ecological knowledge system in influencing the management of mangroves, fisheries and corals?
3. In which ways can the understanding of the Giriama ecological knowledge lead to greater understanding of different worldviews for management of marine resources?

1.3 Objectives of the study

1.3.1 General objective

To explore the ways in which the indigenous system of practices and cosmology of the Giriama community provides a basis for sustainable management of the marine resources.

1.3.2 Specific Objectives

1. To investigate how Giriama indigenous system of practices (experienced events), belief, and context (CPB) provides an epistemological basis for the understanding of indigenous ecological knowledge for managing marine resources;
2. To identify and discuss the Giriama nomenclature on the marine resources and analyse its basis for managing mangroves, fisheries and corals.
3. To describe the ways in which the Giriama ecological knowledge can lead to greater understanding of different worldviews on the management of marine resources.

1.4 Assumptions of the study

1. The Giriama indigenous system of practices provide an epistemological basis for understanding of indigenous ecological knowledge for managing marine resources.
2. Giriama indigenous nomenclature provides an operational system for the management of mangroves, fisheries and corals.
3. Giriama ecological knowledge as an operational system can lead to greater understanding of different worldviews for the management of marine resources.

1.5 Rationale of the study

Throughout the world, indigenous natural resource management systems and strategies may have been lost as a result of acculturation, development, commercial exploitation and formal education. At the same time, indigenous knowledge, particularly in the African context, has long been ignored and maligned by outsiders. Yet there is much we can learn from how communities such as the Giriama, have traditionally used and protected their marine resources using indigenous knowledge. This knowledge may help the rest of the world find appropriate solutions for achieving outcomes that will benefit both the cultural and biological diversity. This will also ensure the resilience and richness of our lives. Yet very little of this knowledge has been recorded, though it represents an immensely valuable data base that provides humankind with insights into how numerous communities have interacted with their changing environment including its floral and faunal resources. This study provided a chance to record some of the indigenous knowledge regarding marine resources management and use before it disappears.

It is noted that, in some areas, attempts have been made to use indigenous strategies to complement contemporary management approaches (IUCN, 1987). This is not enough and, therefore, this study's findings, if adopted by policy makers, provide such a scenario where the Giriama people in particular, and many other indigenous people, would have an opportunity to contribute their traditional ecological knowledge that will be of direct benefit to scientists and non-scientists alike in the protection of marine resources such as reefs, mangrove, fisheries and corals. The findings of this study, if adopted, would also provide an opportunity for such involvement that includes the development of database systems for management strategies, conservation ethics and use regulations. Thus, the Giriama can actively participate in the management of the fragile marine ecosystems.

Traditionally, the scientific approach employed in marine and coastal research has concentrated on the state of natural ecosystems, that is, identifying the damage and disturbances to the ecosystems. Therefore, the scientific advice has always been biased towards the natural ecosystem and its management measures or actions have lacked the human dimension. This study recognised that natural sciences are vital for the understanding of the functioning of ecosystems such as biological organisms, food chains and energy levels. However, this kind of study provided an anthropological approach

which facilitated the analysis of social governance structures, an essential platform from which we can comprehend patterns of human behaviours that influence ecological pressure variables and to finding effective solutions such as community participation, communication channels and regulatory mechanisms in the course of management and utilisation

Although the study recognises the importance of preserving indigenous ecological knowledge for social and cultural reasons as well as for resource conservation, there are also practical reasons why this knowledge is very important. Traditional knowledge is useful for new biological and ecological insights. This is the basis of the new scientific knowledge and it is from the findings of this kind of studies into indigenous environmental knowledge systems that we can derive new paradigms to drive future academic and policy endeavours in marine resources management. Thus, this study on the Giriama people and their indigenous knowledge on marine resources provides an opportunity to explore indigenous perspectives about such ideas as space, boundaries, location, indigenous taxonomy and nomenclature of corals, mangroves and fisheries.

When carrying out data collection on natural resources management, it is also important to integrate scientific data gathering with TEK techniques. This study has demonstrated that when TEK corresponds well with scientific data, it can be a more efficient method of acquiring information. Thus, the findings of this study have not only added to an existing body of scientific knowledge, but can also present a completely different picture of reality, especially when held within an inclusive and comprehensive cosmological and ethical framework. This becomes especially so when we consider alternative cultural narratives about marine resources management.

The findings of the study also demonstrate that adoption of indigenous epistemological systems alongside the scientific approaches will facilitate local and national ownership of resources management programmes. This means that future policy endeavours should take cognisance of the various perspectives in marine resources management. From this point of view, indigenous knowledge should be acknowledged as an alternative way of contributing to the management of resources on Kenya’s coast at both epistemological and methodological levels.

Additionally, the study findings demonstrate the need to recognise indigenous classification of species for purposes of knowledge expansion. This should help to examine and compare the nexus and divergence of indigenous knowledge and scientific classification in coming up with an inventory of species in a given habitat. It is in this regard that we need to acknowledge that ethno-botanists have, to a large extent, led the development of participatory biodiversity inventory. To demonstrate the need for comparing indigenous and scientific taxonomy, reference can be made to the numerous studies detailing lists of local names and uses of plant and animal species against their scientific names.

1.6 Scope of the study

This study was carried out in the Kisauni-Matsangoni area of north coastal Kenya. In regard to content, the study focused on the ways in which the indigenous system of practices and cosmology of the Giriama community provides a basis for sustainable management of the marine resources. It also examines the ways in which indigenous nomenclature provides an operational system for the management of mangroves, fisheries and corals. Furthermore, it was concerned with how understanding the Giriama ecological knowledge as an operational system can lead to rapprochement between indigenous and scientific approaches in the management of marine resources. The study was undertaken between June 2012 and December 2013. The study was guided by the theory of neo-structuralism.

1.7 Limitations of the study

This study faced a number of methodological limitations. One of them was translation of concepts. Due to language barriers it was sometimes difficult for effective communication to take place. This may have impacted negatively on the interpretation of findings in case of misconstrued meanings. Nevertheless, the researcher had assistants who are competent and proficient in the local language, as well as Kiswahili and English. The research assistants were trained thoroughly in interview and observations techniques. The data collection tools were translated into the Giriama language and cross-translated into English again to minimise cross-language misinterpretations of concepts. This, then, helped minimise any inter-language problems.

Another limitation had to do with cultural triage. This is a situation where an indigenous group is forced to rank cultural and natural resources that could be impacted by proposed development projects. This form of triage forces an unnatural ranking of species, areas or heritage sites. These were factored into the methodological framework. The purpose of this was to make it possible for the respondents to emphasize the importance of all resources under consideration.

Another methodological limitation had to do with decontextualisation and distillation of indigenous knowledge. During the research and analysis process, indigenous knowledge could have been inadvertently distilled into a product that is easily integrated into the Western resource management system. This could have removed the traditional ecological knowledge from its cultural and ecological contexts. Consequently, this in effect could have translated indigenous knowledge into a tool of Western science, rather than a complementary approach to natural resource management. Thus, efforts were made to ensure that indigenous knowledge is contextualised and distillation into Western schema avoided.

1.8 Definition of key terms

Conservation ethic is an aspect of resources management in which resource conservation is part and parcel of resource utilisation. Its primary focus is upon maintaining the health of the natural world including its fisheries, habitats, and biological diversity. The secondary focus is on materials conservation and energy conservation, which are seen as important to protect the natural world. The principal value underlying most expressions of the conservation ethic is that the natural world has intrinsic and intangible worth along with utilitarian value.

Ecology is the study of the distributions, abundance and relations of organisms and their interactions with the physical environment. In this study ecology refers to the distribution, composition, abundance of fisheries, mangroves and corals and their relations within the marine ecosystem.

Indigenous knowledge is the local knowledge that is unique to a culture or society. In the context of this study, this is expertise related to marine resources such as fisheries, mangroves and corals. This is knowledge and information that has been passed down from generation to generation, usually by word of mouth and cultural rituals, and has been the basis for natural resources use, food production and preparation, health care, education, conservation and the wide range of other activities that sustain the Giriama society and its environment in terms of marine resources for many centuries.

Local community is a geographically defined community of place as well as a group of people living close to each other. The term local communities refers to towns, villages or other units within the Giriama community. In this study local community refers to the Giriama (and those groups which have been assimilated) people living around the marine resources who are directly affected (both positively and negatively) by the resources.

Marine conservation is the protection, preservation and restoration of ecosystems in the Indian Ocean. In this study marine conservation is concerned with fisheries, mangroves and corals.

Marine resources refer to naturally occurring endowments in the marine environment including oceans, salt marshes and intertidal ecology, estuaries, lagoons, mangroves, coral reefs, the deep sea and the sea floor. For the purposes of this study they refer to mangroves, fisheries and corals.

Natural resources management refers to the management of natural resources such as land, water, soil, plants and animals, with a particular focus on how management affects the quality of life for both present and future generations. In this study, natural resource management is congruent with the concept of sustainable development, a scientific principle that forms a basis for sustainable global land management and environmental governance to conserve and preserve fisheries, corals and mangrove resources. Natural resource management specifically focuses on a scientific and technical understanding of resources and ecology and the life-supporting capacity of those resources.

Nomenclature/Taxonomy refers to either a list of names and/or terms, or to the system of principles and procedures related to naming - which is the assigning of a word or phrase to a particular object or property. The use of names of plants and animals connects nomenclature to the way the community mentally structures the world in relation to word meanings and experience relates to the physical environment and the resources found in the environment. In this study it was considered as part of taxonomy which the local community uses to identify, name and classify marine resources.

Operational ecological knowledge system is the management of natural resources such that vital ecological functions and processes are maintained and that ecological functioning depends on ecosystem structure and diversity. It recognises that ecosystems are spatially and temporally dynamic, and the importance of adaptive learning for effective resource policy development in response to such dynamics.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter is divided into two parts, namely, literature review and theoretical framework. The literature is considered under two major sub–sections which are: traditional ecological knowledge and the utilization of indigenous knowledge in marine resources management. The first part is subdivided into three sub-sections, namely, origins of traditional ecological knowledge and its development as a field; traditional ecological knowledge and science; and, finally, the significance of traditional ecological knowledge. The second part of this section deals with the theoretical foundations of indigenous knowledge and natural resources management. The first subsection deals with paradigmatic shifts in understanding human-environmental relationships while the second part deals with the theoretical framework that guided the study, namely, neo-structuralism. The last part of the chapter deals with the relevance of neo-structuralism to the study.

2.2 Literature Review

2.2.1 Traditional ecological knowledge

The theme of traditional ecological knowledge is important for the consideration of a broad range of questions related to nature-human relations. Different groups of people in various parts of the world perceive and interact with nature differently, and have different traditions of environmental knowledge. Their perceptions and knowledge are in part shaped by their values, worldviews, and environmental ethics - religion in the broader sense (Robbins, 2010:11). In the exploration of environmental ethics and religion towards an ecologically sustainable society, indigenous peoples and traditional ecological knowledge have attracted considerable attention from both scholars and popular movements (Shilabukha, 2000: 16).

Traditional ecological knowledge may be defined as a cumulative body of knowledge, practice and belief evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environments (Berkes, 1999:33). As a knowledge-practice-

belief complex, traditional ecological knowledge includes the worldview or religious traditions of a society. It is both cumulative and dynamic, building on experience and adapting to change, as societies constantly redefine what is considered "traditional" (Robbins, 2010:12). It is an attribute of societies with historical continuity in making a living in a particular geographical locus (McCay, 2002:398; Robbins, 2010:12; Ruddle and Johannes, 1992:256).

Many discussions of traditional ecological knowledge and indigenous knowledge focus on North American Indian peoples. However, there are many other traditions of ecological knowledge in various indigenous societies in South America, Australia, and parts of Africa and Asia. Culturally transmitted, cumulative and multigenerational, indigenous knowledge is held also by some groups that have European backgrounds, such as Newfoundland fishers and Swedish, Swiss, Finnish and Norwegian Alpine Sami people (Balee, 1989: 37**;** Williams and Baines, 1993:5; Callicott, 1994:11).

Traditional ecological knowledge may be considered as a sub-set of indigenous knowledge, defined as local knowledge held by indigenous peoples or local knowledge unique to a given culture or society (Williams and Baines, 1993:7). However, there is controversy over the term “traditional”. Some scholars, such as Foale (2007), consider that the term implies backwardness, and instead favour "indigenous" or "local". Others point out that many indigenous peoples themselves see "tradition" in a positive light (Couzin, 2007: 1518; Wehi, 2009:267). They do not take it to mean inflexible adherence to the past but rather to mean time-tested and wise (Robbins, 2010:66). These considerations make it difficult to generalise about traditional ecological knowledge. But, in any case, one cannot generalise about "the Amerindian (or African) view of nature" (Posey and Dutfield, 1996:3).

Consequently, every cultural group has within it a range of environmental values, ethics and a range of practices. The environmental relations of a group are not uniform; they are shaped by the day-to-day contingencies, as well as their worldview and ethics. That is the reason why environmental ethics do not describe how people actually behave, but rather indicate how they ought to behave. Human-nature relationships tend to be ambivalent,

and that is why there often is a discrepancy between belief and practice (Patnaik and 2002:56).

2.2.1.1. Origins and development of traditional ecological knowledge

There is a very rich and elaborate corpus of literature on various kinds of indigenous environmental knowledge (Shilabukha, 2000:5; Willis, 1990:4; 2010:28). For example, traditional agricultural practice is a major field of indigenous knowledge; others include traditional medicine and architecture. Much of the indigenous knowledge literature is not about ecological relationships but about other kinds of ethno-science, including agriculture, ethno-biology, ethno-pharmacology, ethno-veterinary medicine, and ethno-pedology (soils). Some of these areas, for example, traditional practices of water conservation and soil erosion control, are directly related to ecological knowledge, but others such as ethno-astronomy are less so (Posey, 1985). The shift of emphasis from the documentation of species used by indigenous groups and their taxonomy to a consideration of functional and structural relationships and mechanisms gave rise to the field of traditional ecological knowledge (Berkes, 1999:35,154).

The field borrows heavily from the cultural ecology tradition of the anthropologist Julian Steward (1958:11) who emphasized the study of adaptive processes, and argued that a social organisation itself may be considered an ecological adaptation of a group to its local environment. A number of scholars such as Balee (1989:51-84) as well as Berkes (1999:22) have agreed with Steward's argument. The emphasis on adaptive processes in human-nature relations as observed in traditional ecological literature, overlaps with cultural ecology, ecological anthropology or anthropological ecology and anthropology of conservation but is not a sub-set of these fields because it often goes beyond the discipline of anthropology (Acheson *et al.* 2003; Williams and Baines, 1993; Acheson, 2003).

The intellectual roots of traditional ecological knowledge are in ethno-science (mainly ethno-botany) and human ecology (Berlin, 1975:258; Hunn, 1975:5). The field has its roots in the study and documentation of lists of species used by different indigenous groups, and elaborated a science of folk taxonomies of plants and animals later, and of other environmental features such as soils (Berlin, 1975:265; Shilabukha, 2000:14). Early

ethno-botany goes back at least to Barrows' 1900 work on the Coahuila Indians of southern California who made a living in a seemingly barren desert environment by harvesting no less than 60 kinds of edible plants and 28 kinds of medicinal plants (Berlin, 1975:257; Warren *et al.* 1995:5). However, the science of folk taxonomies is often associated with the name of Harold Conklin who in the 1950s documented the extensive plant knowledge and classification systems of traditional groups such as the Hanunoo of the Philippines (Warren *et al.* 1995:15).

The rapid development of traditional ecological knowledge as a field in its own right started with the documentation of a tremendously rich body of environmental knowledge, not just of species but also their ecological relations among a diversity of groups outside the mainstream Western world. These included studies of shifting cultivation and biodiversity conservation in tropical ecosystems and traditional knowledge and management systems in coastal fisheries and lagoons, semi-arid areas, and the Arctic (Balee, 1989:147; Berkes, 1999:154; Callicot, 1994:11). These studies showed that a variety of traditional peoples, in diverse geographical areas from the Arctic to the Amazon, had their own understandings of ecological relationships and distinct traditions of resource management (Callicot, 1994:10).

By the mid-1980s, the rapidly growing literature on traditional ecological knowledge led to a recognition in the international arena of its potential applications to contemporary resource and environmental problems. This recognition is reflected in the report of the World Commission on Environment and Development (UNCED, 1987:12,114). The report pointed out that indigenous peoples hold a wealth of knowledge based on thousands of years of experience, and that their practices can offer modern societies lessons in the management of resources in complex forest, mountain and arid land ecosystems (Majid-Cooke, 2003:270).

2.2.1.2 Traditional ecological knowledge and science

Even though the importance of traditional ecological knowledge is recognised in the international arena and the number of publications has grown rapidly since the 1980s, the relationship between Western science and traditional knowledge has remained controversial (Foale, 2007). There are both similarities and differences between

traditional science and Western science. Both kinds of knowledge are ultimately based on observations of the environment, and both result from the same intellectual process of creating order out of disorder. But they are different in a number of substantive ways. Traditional ecological knowledge is often an integral part of a culture, and tends to have a large social context (Robbins, 2010: xiv). Different kinds of traditional knowledge have their own rules, but they are different from science regarding the rules of empirical evidence and repeatability (Berkes, 1999:35). This is the basis of validity and reliability for empirical western science.

However, some scholars raise the red flag over the validity of indigenous knowledge, and this is the foundation of conflicts between indigenous knowledge and natural science (Gehl, 2013: 56). Some of the conflicts between science and traditional knowledge are related to claims of authority over knowledge. In the modernist tradition, Western science is seen as having a monopoly over truth about the nature and structure of matter. Hence, knowledge and insights that originate outside institutionalised Western science are not easily accepted. Thus, some natural scientists tend to dismiss understandings that do not fit their own (and this often includes understandings of other scientists using different) paradigms. They then tend to be sceptical, demanding evidence when confronted with traditional knowledge that may not easily lend itself to the scientific verification demanded.

Some traditional knowledge may include elements such as the religious and spiritual dimensions of the environment, which do not make sense to science. For example, many of the Dene (Athapascan) peoples of the North American sub-arctic believe that some non-living parts of the environment (including rivers and mountains), as well as all living beings, have a spirit. Yet we know that science has no tools for the study of the spiritual dimensions of the environment. Nonetheless, such beliefs are important for understanding traditional ecological knowledge among indigenous communities (Williams and Baines, 1993:10).

On their part, traditional knowledge holders are sceptical of book learning, and tend to dismiss scientists who do not have extensive first-hand knowledge of a specific land area. They are also often baffled by the preoccupation of scientists with measurement and

quantification of everything. Thus, power relations become an issue when Western experts and Aboriginal experts have different political agendas (Captini *et al.* 2004: 770).

Traditional ecological knowledge has frequently been used to assert indigenous land and resource rights and to fight government-imposed development projects on native land. In turn, science may be used to justify the very same projects (Berkes, 1999:37). This may not happen especially if one agrees with postmodern philosophers of science that Western scientific methodology is merely one way, and not the only way, to acquire knowledge. However, it is the one that happens to be the dominant knowledge system and, by far, the one used as the basis of environmental decision-making by centralised bureaucracies throughout the world (Foale, 2007).

2.2.1.3 Significance of traditional ecological knowledge

Traditional knowledge and Western science need not be thought of as opposites, but rather as points of agreement than disagreement. The use of traditional knowledge contributes to conceptual pluralism, and expands the range of approaches and information needed to solve environmental problems. The explosion of interest in traditional ecological knowledge since the 1980s is in part related to its practical significance (UNCED, 1987:114). However, the interests of the various parties are quite different. For many indigenous groups, the broader social and cultural aspects of traditional knowledge are very significant, and this is one of the reasons why dealing with traditional ecological knowledge has become politically volatile. In many indigenous areas, researchers no longer have a free hand to conduct their work independently from the people themselves (Johnson, 1992:3; Shilabukha, 2000:14).

Politically organised groups of indigenous peoples are beginning to assert control over their knowledge systems for at least two reasons. First, some of them have seen their knowledge and biological resources (for example, medicinal plants) turned by others into profit making commodities (Zweifel, 1997:7). Thus, they have started to ask the question of who benefits from the recording of their knowledge and to investigate how they themselves can control their knowledge and products (Warren, 1992:5; Posey, 1998:10).

Second, indigenous knowledge has become a symbol for many groups to regain control over their cultural information. Reclaiming and documenting indigenous knowledge has become a major strategy in many parts of the world for movements of cultural conservation, preservation and revitalisation. For example, many of the Aboriginal groups in Alaska and Northern Canada have been carrying out their own traditional knowledge studies as part of an effort to strengthen their culture, educate their young people, prepare land and resources claims, and assert their rights (Posey, 1998:1200). Such revitalisation is not merely a cultural exercise; it is about empowerment and political control.

The need for indigenous groups to control their knowledge has to be balanced against the importance of traditional ecological knowledge as the common heritage for the whole of humankind. There are tangible and practical reasons why traditional ecological knowledge is important for the rest of the world's people. Scholars have identified some areas in which traditional ecological knowledge is significant. First, it is a source of biological knowledge and new ecological insights (Greaves, 1996; Zweifel, 1997:7). Second, indigenous knowledge is important for the sustainability of difficult-to-manage ecosystems such as tropical forests and wetlands. Additionally, it is important for community-based conservation by connecting human values with conservation values.

Third, some traditional systems are of special interest for biodiversity conservation because they are based on multiple-use principles that distribute resource-use pressures in space and time. We may also add that in-depth and perceptive local environmental knowledge and trends over time for a given site are important for environmental assessment. In addition, traditional knowledge is essential for development, especially for "bottom-up" as “opposed to top-down” development planning with people (Binder and Hanbridge, 1993:21; Berkes, 1999:35).

Fourth, traditional ecological wisdom is a source of inspiration for environmental ethics. In this regard, belief systems of many indigenous groups incorporate the idea that humans are part of the natural environment, and that their relationships with nature may be characterised as peaceful co-existence. Callicott (1994:12) points out that some traditional ecology sees humans and nature in a symbiotic relationship, with mutual obligations leading to "respect," a central idea in the relations of many Amerindian groups with

nature. It is from the above observations that we note the explosion of interest in traditional ecological knowledge in recent years as a reflection of the need to derive ecological insights from indigenous practices, and the need to develop a new ecological ethic based on indigenous wisdom (Shilabukha, 2000:7; Alexiades and Laird 2002:12).

2.2.2 Marine resources

Tropical coastal zones contain a variety of ecosystems and resources such as mangroves, corals, coral reefs, sea grass beds and fisheries. These marine resources form a very core resource base for many communities around the world. Mangroves are an important part of these resources and are plant communities of the intertidal coastal zone in the tropics and subtropics (Duke, 2006; Spalding *et al.* 2010). These trees, shrubs and herbs have developed morphological, physiological and/or reproductive strategies adapted to the harsh saline, waterlogged and anaerobic environmental conditions (Duke, 2006; Hogarth, 2007; Spalding *et al.* 2010; ITTO, 2012).

The adaptation strategies of mangroves have been comprehensively described by a number of authors, for example, Clough (2013) and Ong and Gong (2013). Mangrove species can be categorised into true mangroves and mangrove associates (Selvam, 2007; FAO, 2009; Wang *et al.* 2011). True mangroves are exclusive species, which are adapted to the mangrove habitat, and do not extend into other terrestrial plant communities. Plants that occur in the coastal environment and also within mangroves are considered as mangrove associates or non-exclusive species. A total of 52 species have been identified by Giesen *et al.* (2007) as true mangroves.

Mangroves are important ecosystems that provide a wide range of goods and services to human communities living in coastal areas (Shilabukha, 2000; Clough, 2012). The array of benefits derived from mangroves includes wood and non-wood forest products, fisheries, recreation, ecotourism, bio-filtration, coastal protection, and carbon storage and sequestration (Spalding *et al.* 2010). Human uses of mangrove resources have been categorised into traditional, commercial and destructive uses (Field, 1995). These uses can be direct or indirect.

Direct uses involve the tangible benefits of mangrove forest products and mangrove-associated fisheries. On the other hand, indirect uses involve the intangible benefits of ecosystem services (Saenger *et al.* 1983; Ewel *et al.* 1998; Hogarth, 2007; Walters *et al.* 2008). The former entails the direct use of products from the ecosystem while the latter depends on the use of the mangrove ecosystem as a whole (Bandaranayake, 1998). Different mangrove species have different wood and bark properties. The difference makes some more suitable than others for specific uses (FAO, 1994). For example, genera such as *Rhizophora*, *Bruguiera* and *Ceriops* are characterised by their heavy hardwood and tannin-rich bark. Thus, they are widely valued for construction, fuel wood and tannin extraction (Ewel *et al.* 1998: 85). Their wood, therefore, is not suitable for timber or furniture making because of its tendency to split.

Harvesting and processing of mangrove wood is a full-time occupation for the many communities living near mangrove areas. In many countries where mangroves are found, local communities depend on mangrove products to meet their subsistence needs for fuel and construction (Clough, 2013). Due to the widespread dependence of coastal communities on mangrove wood products, users harvest what is most readily available to them (Ewel *et al.* 1998: 87). Therefore, the impact of mangrove resource use by local villages can be sustainable as it forms an integral part of the ecology and functioning of the ecosystem (Spalding *et al.* 2010). However, with population growth and increasing demand, most mangrove forests are showing various levels of degradation due to over-harvesting of their products. This is compounded by large-scale commercial and destructive uses, which have led to the loss of mangrove forests (Spalding *et al.* 2010).

Apart from the mangroves, fisheries are also an integral component of marine resources. For many people, these are aquatic animals found in the sea, both vertebrates and invertebrates. Humans have fished since the dawn of human history, and overfishing impacts have been apparent even in some primitive societies at relatively low population density (Wing and Wing, 2001). It is notable that the majority of people living in mangrove areas are fishers, which means they derive their livelihood from fishing and related activities (McGoodwin, 2001; Walters *et al.* 2008). Hence, marine fisheries comprise a substantial, if not, a major source of protein to the world's population, and

research has suggested that they support an industry worth over $85 billion annually (FAO, 2009).

Historically, it was during the 20th century that fishing expanded rapidly to the global scale that it is today as a result of motorised vessels, inexpensive oil, refrigeration, increasingly global commodity markets, and heavy government subsidies to increase fleets (Pauly *et al.* 2002). Consequently, fishing has transformed the world's oceans in a fundamental way than hitherto envisaged (Jackson *et al.* 2001; Pauly *et al.* 2005; Hassan *et al.* 2005). Moreover, since advances in technology have made humans a dominant force of nature in the seas as they are on land, they often affect marine fish resources negatively in a number of ways. One of them is overfishing. This takes place when fish supplies fall below standard levels due to excessive fishing. Humans also engage in destructive fishing practices such as beach seining and dynamite fishing (Pauly *et al.* 2005).

Though, the greatest threat to fisheries is bottom trawling, where the fishermen suspend large nets from boats to drag the bottom of the oceans and end up with other marine animals and organisms such as corals in their nets, which threatens the biodiversity by killing animals unnecessarily and damaging the ocean environment (Pauly *et al.* 2002; Jackson *et al.* 2001). Then there is pollution of the ecosystem, directly or indirectly. Direct pollution occurs through disposal of sewage, litter, boat exhaust, and oil spills, while indirect pollution occurs through deposits of phosphates and nitrates from agricultural runoff (McGoodwin, 2001).

While evaluating the future of fisheries depends in part on what we as a society want from the oceans, several issues complicate any predictions. One of them is that continued harvest stability is questionable (McGoodwin, 2001; Pauly *et al.* 2005) yet, it is still poorly understood how such sustained high harvest levels affect stock stability in the face of natural and anthropogenic, that is, human-derived disturbances. Increasing evidence shows that both individual fish populations, and the more complex ecosystems in which they are included, can respond in a non-linear fashion to exploitation and other pressures (Petersen *et al.* 2008; Daskalov *et al.* 2007), but these may cross a tipping point into a

new stable state that is resistant to attempts to restore it to the original state (Petersen *et al.* 2008; Daskalov *et al.* 2007). Simultaneously, demand will continue to increase.

Global human population is increasing rapidly; it is likely to roughly double before stabilizing at an estimated nine billion (Daskalov *et al.* 2007). The average per capita resource use is increasing even faster, which means that the human population's already large demand for fish and other resources will undoubtedly increase a great deal in the coming decades (Daskalov *et al.* 2007).

Conversely, as McGoodwin (2001) has noted, most of the fishing in the world is undertaken by small-scale capital commitments. These activities are dispersed along coastlines since communities depend on marine ecosystems. The implication is that the nature of fisheries ecosystems and the particular species exploited are an important determinant of many cultural characteristics, social and economic organisation, and the fishing gear and the technologies that are employed. Accordingly, for many fishing communities, the various fishing occupations that members pursue are interwoven through the communities' culture. That may explain why a systematic division of labour along gender and age continua will emerge (McGoodwin, 1990; Hviding, 2003).

As a result, in exploiting marine fisheries, communities have developed cultural adaptations to the risks and uncertainties which are associated with fishing activities. These may include symbolic regulation, beliefs, ritualised behaviour and taboos which not only facilitate psychological coping but also ensure ecosystem health and conservation (Moran, 2000). In consequence, it is not surprising to find that most of these communities have developed management practices which can be distinguished from that instituted by the government and its agencies. This is the basis of indigenous knowledge in management of marine fisheries.

Indeed, the future of marine fisheries can be seen as a microcosm of the future of human society generally. As a future way of assessing the future of fisheries and their utilisation, we need to consider how values influence attitudes towards fishery management and conservation. Herein lies the role of indigenous communities and their management systems.

Another important aspect of the marine resources is the coral reef. On its part the coral reef is the most diversified and complex of the marine ecosystems. It provides humans with many benefits including food from reef fish, recreation for tourists, coastal protection and lime for the building industry (Berg *et al.* 1998). Hence, many people depend on coral reefs, not just for their livelihood, but also for monetary considerations. The coral reefs of Eastern Africa, for example, support an intensive and mainly artisanal fishery that employs tens of thousands of fishers (Johnstone *et al.* 1998). In terms of total fisheries catch, virtually all demersal fish are taken from coral reefs and a significant part of the other components are also taken from the coral reefs (Johnstone *et al.* 1998).

Besides, seaweed cultivation is one of the most lucrative marine resource-related activities for many communities in the region. Thus, in the light of the fisheries alone, coastal communities are highly dependent on coral reefs for their livelihood and welfare. However, poor management of the coral reefs around the world has resulted in resource depletion and ecosystem degradation (Berg *et al.* 1998). Therefore, it is important that they be managed in a sustainable manner. Thus, there is need for studies to be carried out to provide incentives for new management strategies, including indigenous management systems for sustainable use of the ecosystems.

2.2.3 Indigenous knowledge and marine resources management

As long as people have lived next to the ocean shoreline and used resources therein or adjacent to it, means there has been some form of coastal resources management even if latent and inadvertent (Hale *et al.* 1998:24). Local communities usually depend on coastal resources for various livelihood and subsistence reasons. This means that they have developed elaborate management and governance systems. These systems have in essence evolved a sustainable and symbiotic relationship between the people and resources (Zavarin, 1991:253; Ruddle, 1994:30; Hale *et al.* 1998:23).

As a result, many communities possess considerable knowledge of the natural resources they use. Such knowledge can potentially inform scientific approaches to management. This can happen in two ways. First, indigenous knowledge can be a source of baseline data to fill information gaps that cannot otherwise be addressed. Second, it can provide substitute management approaches from which scientists and managers might learn. In

general, however, little attention has been given to the relevance of quantitative forms of such knowledge for resource management (Ihezue, 2007:320).

Traditional resource management systems may, thus, be viewed as experiments in successful living, and drawing upon knowledge of these alternatives may provide insights and "speed up the process of adaptive management" (Holling *et al.* 1973:3). There are several similarities between traditional or indigenous management systems and adaptive management. If the orderly and rational science of the Age of Enlightenment is replaced by a new paradigm along the lines of adaptive management, the chasm between indigenous knowledge and Western science essentially evaporates. In support of this view, at least one Native American scholar (Cajete, 2000:30) has recently gone so far as to describe TEK as a "Native science" which focuses upon the study of "natural laws of interdependence".

Many of the prescriptions of traditional knowledge and practice are consistent with adaptive management as an integrated method for resource and ecosystem management (Berkes *et al.* 2000:1251; Ruddle, 1994:32). In this way, indigenous knowledge systems emphasize processes that are part of ecological cycles of renewability and regards human use of the environment in terms of how well it fits these cycles. These consider change as inevitable and assume that nature cannot be controlled and yields cannot be predicted. As such, uncertainty and unpredictability are considered to be characteristics of all ecosystems, including managed ones. Thus, social learning appears to be the way in which societies respond to uncertainty. Often, this involves social learning at the level of society or institutions and indigenous knowledge is one of the institutions.

Indigenous ecological knowledge is based on detailed observation of the dynamics of the natural environment, feedback learning, social system/ecological system linkages, and resilience-enhancing practices. Thus, it bears a strong resemblance to adaptive management (Berkes *et al.* 2000:1253). In a sense, this knowledge may be seen as a "rediscovery of nature". Take, for example, the management of ecological processes at multiple scales. Based on ethno-historical information and current practice, Cree hunters of James Bay in sub-arctic Canada seem to be simultaneously managing beaver populations on a 4-6 year time scale, lake fish on a 5-10 year scale, and caribou on an 80-

100 year scale, with a well-established code of practice appropriate for each resource type. The rules and practices of resource use, for both temporal and spatial scales, and the kinds of environmental information that provide feedback, for example, to relocate to a new fishing area, have been documented extensively through participatory research with the Cree (Berkes, 1999:22).

Ecosystems are in part socially constructed, and resource management and conservation practices in indigenous systems are based on a variety of social processes. One set deals with the generation, accumulation and transmission of indigenous knowledge. A second set concerns the structure and dynamics of institutions, including leadership and rule making. A third set is about rituals and ceremonies that provide cultural processes for the internalisation of indigenous ecological knowledge practices. A fourth set deals with the world view and cultural values of the group in question. Each of the processes is incorporated in cultural practices in various places in the world (Posey, 1998:5).

Therefore, indigenous knowledge is not only as "knowledge" or "technique", but also as a knowledge/practice/belief complex in which the context is provided by culture and history (Berkes, 1999:22). Accordingly, the importance of TEK in the conservation of biodiversity, in this study, is demonstrable in the sense that one cannot merely learn from traditional techniques of biodiversity conservation outside of their cultural context (Berkes *et al.* 2000:1253). Nor can one discuss, in a decontextualised way, the possible contribution of TEK to sustainable land use, environmental assessment or ecological restoration (Preston *et al.* 1995:378; Stevenson, 1996:278; Kimmerer, 2000:5).

For indigenous communities, such as the Giriama, a given resource unit provides the bio-geographic boundary for a terrestrial ecosystem; as such, it is the starting point for ecosystem management. The use of resource units in indigenous systems provides evidence for the existence of ecosystem-like concepts among several cultures. The rediscovery of such ecosystem concepts among traditional peoples has been important in the appreciation of TEK among scientists (Berkes *et al.* 2000:1257; Preston *et al.* 1995:380; Berkes, 1999:38).

And therein lies the knowledge gap in the management of marine resources in Kenya, in general and the area inhabited by the Giriama in particular. As noted earlier, traditionally, the scientific approach employed in marine and coastal research has concentrated on the state of natural ecosystems, that is, identifying the damage and disturbances to the ecosystems. This approach does not appreciate and acknowledge the potential of the indigenous culture, through indigenous knowledge and management systems, to contribute to and supplement the protected area approach in sustainable marine resources management (Badalamenti *et al.* 2000). That is why it has to be pointed out that the Giriama people have lived with mangroves, corals and fisheries for ages and have been managing the resources prudently. They have, in the process, developed management regimes based on time-tested and experiential learning. However, their contribution to management of the marine resources has not been documented or appreciated. This is a management gap that the study set out to address.

2.3 Paradigmatic shifts in understanding human-nature relationships

Various theories and paradigms have been advanced to explain the relationship between culture and the environment. This stems from the anthropological premise that culture is the main mechanism through which human groups adapt to their environment. One of the most employed concepts in explaining this relationship is the ecosystem. The concept of the ecosystem was first introduced by Sir Arthur Transley in 1935 to the ecological community (McCabe, 2007:5). Almost thirty years later, the concept was introduced into anthropological literature with the publication of *Agricultural involution* by Clifford Geertz (1963). Ever since, the examination of the human-environmental relationships has been a subject of serious study in anthropology.

Transley's first presentation of the ecosystem concept was in regard to the notion of the biological community and the idea that biological communities would change through time until a "climax" community was reached or achieved (Golly, 1984: 33). Much of the understanding in the studies of community ecology and successional change at that time was based on the work of Clements published in 1916 (McCabe, 2007:7). The focus of these studies was on how the environment affected vegetation, organisms and population. This was usually confined to the context of successional change though time (McCabe, 2007:5).

In Transley's thinking, biological organisms and the physical environment in which they were operand were far more interrelated than was assumed by the studies at that time. Central to Transley's notion of the ecosystem was the idea that the web of relationships between the organisms and the physical environment led to a state of equilibrium. This thinking tends to fit snugly into the naturalists' ideas concerning the balance of nature. Subsequently, the ecosystem concept gained gradual and eventual acceptance in the 1940s and 1950s (Steward, 1955; McCabe, 2007:14).

During the 1960s, ecological research became more systems-oriented with 'eco-energies' the core of ecosystem analysis (McCabe, 2007:10). This new ecology is the paradigm that influenced anthropologists who first began to use the concept of the ecosystem in their own work. In early ecosystems studies conducted by ecologists and biologists, the role of humans in the environment was usually relegated to a form of disturbance and external factor in the natural order (Golley, 1988). As a result, in adopting the ecosystem concept, anthropologists sought to locate humans at the centre of the ecosystem studies. Although Geertz (1963) is credited with the first use of the ecosystem as an analytic concept in anthropology, it was Rappaport (1968:22) who demonstrated the potential power of ecosystem studies in anthropological analysis of human behaviour. His use of the concept as an analytic unit was a significant departure from the way that human-environmental relations were studied in the 1950s and 1960s (McCabe, 2007:11).

At the time, Julian Steward's (1958) cultural ecology was viewed as the dominant paradigm in understanding human-environmental relationships. However, Steward (1958) was not concerned with the environment *per se*. Rather, he was concerned with the critical food resources and the manner in which they were exploited. His central argument was that the way natural resources were exploited would have a strong influence upon what he referred to as core forms of social organisation (Steward, 1955). And these core forms of social organisation would have a bearing upon many other aspects of people's lives and social organisation. Despite the theoretical advances made by Steward, his framework of social reality was criticised for ignoring important environmental variables such as disease and population pressure. It was also criticised for being subjective in identifying aspects of what he referred to as "the affective environment" and the culture core (Netting, 1968; Ellen, 1982).

Structural anthropology is another school of thought that arose during the same epoch. This theory is based on Claude Lévi-Strauss' (1963) idea that people think about the world and the environment in terms of binary opposites—such as high and low, inside and outside, person and animal, life and death. He also postulated that every culture can be understood in terms of these opposites. Lévi-Strauss' (1963) approach arose, fundamentally, from the philosophy of Hegel, who explains that in every situation there can be found two opposing things and their resolution; he called these "thesis, antithesis, and synthesis" (Barnard, 2000:75).

Following in the footsteps of Hegel, Lévi-Strauss argued that, in fact, cultures have this structure (Barnard and Good, 1984). He showed, for example, how opposing ideas would fight and also be resolved in the rules of marriage, in mythology, and in ritual (Lévi-Strauss, 1963). This approach, he felt, made for fresh new ideas about how people perceive the world around them. This theoretical approach gave way to various schools of thought such as structural feminism, post-structuralism and, finally, neo-structuralism.

Post-structuralism argues that human culture may be understood by means of a structure that is modelled on language, this differs from concrete reality and from abstract ideas (Derrida (1992). This theoretical approach offers a way of studying how knowledge is produced and critiques structuralist premises. It argues that because history and culture condition the study of underlying structures, both are subject to biases and misinterpretations. A post-structuralist approach argues that to understand an object, for instance a text. Therefore, it is necessary to study both the object itself and the systems of knowledge that produced the object. On its part structural feminism emphasizes the contingent and discursive nature of all identities and in particular the social construction of gendered subjectivities (Randall 2010). An important contribution of this branch was to establish that there is no universal single category of "woman" or "man" and to identify the intersectionality of sex, race, ethnicity, class, sexuality and nationality.

2.4. Theoretical Framework

2.4.1 Neo-structuralism

This study was guided by the theory of neo-structuralism, which revolves around the idea that social unity is problematic and should not be taken for granted (Ericson and Murphy,

2008:161). Therefore, human beings are essentially forced to repeatedly construct social life and reality against those forces in the natural world that threaten to destroy or distort it. Symbols are the primary vehicles around which this social life and reality are organised. Therefore, they are the instruments or tools employed by humans to achieve social order. The theory borrows heavily from the structuralism originally propounded by Lévi-Strauss, which fundamentally looks at levels of social reality (Lévi-Strauss, 1963:18).

This brand of structuralism inspired the work Edmund Leach (1982), who was critical towards the structural-functionalist perspective and who drew on Lévi-Strauss (1963). However, he also found grounds for critiquing Lévi-Strauss. Leach, who in stark contrast to Lévi-Strauss was more concerned with researching people's actual lives rather than with the discovery of universal mental structures, found that the latter's analysis of some cultures contained serious flaws. According to Leach (1982), Lévi-Strauss was ambitious, meaning that his analyses were too superficial and the available data treated with too little care.

His own analysis of the Kachin groups found that they were supposed to marry in a circle ideally consisting of five groups. In reality, the system was strongly imbalanced with built-in status differences between superior wife-givers and inferior wife-takers. Lévi-Strauss (1963:15) had incorrectly assumed that wife-takers would be of higher rank than wife-givers; in reality, it was the other way round, and the former usually had to make substantial bride wealth payments to obtain wives. Overall, some lineages would accumulate more wives and material wealth than others, meaning that the system cannot be said to be driven primarily by reciprocity. In reality, the marriage system was quite messy and the chance of it breaking down increased with the number of groups involved.

In generalised exchange systems, the more groups there are the more complex it becomes important to keep track of all transactions and to ensure that all wife-givers will eventually be on the receiving end, an issue that Lévi-Strauss had already foreseen. He thought that in practice there will be competition for women, leading to accumulation and, therefore, asymmetries in the system. According to Leach (1982:25), in some kinship systems, reality instabilities arise primarily from competition for bride wealth. Men seek

to get the maximum profit in forms of either bride wealth or political advantage out of the marriage of their daughters. Lévi-Strauss (1963:15) had only accorded a symbolic role to marriage prestations, effectively overlooking their significance within the system. Leach, therefore, argued that they are also (or even primarily) economic and political transactions, and are frequently connected to transfers of rights over land, too.

Kinship is, therefore, not an isolated domain but linked to economic and political structures. Marriage exchanges need to be analysed within their wider economic and political contexts rather than in isolation, as Lévi-Strauss tended to do (Barnard, 2000:78). Leach charged the latter with neglecting the effects of material conditions on social relations. He also challenged the claims to universality made by Lévi-Strauss about the model, doubting whether structures generated by marriage rules would be the same in different social contexts. This is the basis of neo-structuralism.

Neo-structuralism is concerned with grasping how the unconscious structures underlying each institution, tradition, norm, value and custom within a culture are tied to the symbolic meanings embedded in the culture and interpreted through lived experience (Kuper, 2006:85). In this theory, the institutions are presented as layers with structural interconnections. This is because cultural institutions provide building blocks to the understanding of the whole. They are the underlying structures which the brain is designed to interpret. Therefore, the unconscious activity of the mind consists imposing forms upon content. And as Levi-Strauss (1963:21) holds, "if these forms are fundamentally the same for all minds, it is necessary and sufficient to grasp the unconscious structures underlying each institution and custom".

Those institutions are cultural expressions that are usually unexamined by their users because they are the unconscious foundations of social life, underlying structures of cultures. Hence, the search for these underlying structures lead anthropologists to explore systems of classification and the logic of symbolism in culture. That is why we know about the external world by the interpretation of the brain through our senses but our senses comprehend the external world through a plethora of meanings which are embedded in our cultural symbols. This means that kinship terms, for instance, have a bearing on or derive one from marriage arrangements of a community (Kuper, 2006:82).

The essence of social order and solidarity lies in concrete institutions and formalised relationships within the society. Therefore, cultural institutions bring about social order through symbolic logic that connects the people (Erocson and Murhy, 2008:160). Culture is, therefore, a result of symbolic correspondence and contrasts. This how we can explore ways in which various objects and actions of rituals, for example, are deployed as complex instrumental symbols that act as means to the end of that particular ritual, such as immersing individuals in water during baptism as a means of washing the original sin away from their souls so as to admit them into Christianity. That act of immersion and re-emergence symbolises death and rebirth, respectively.

Derrida (1992:114), Husserl (1989:18) and others have expanded on this proposition by postulating that structures intervene at strategic points in the interwoven strands of knowledge and culture (Rorty, 1989:6). Structure in this sense is about objects, experiences or events that get inscribed in the consciousness proposing grids or patterns without which they would not appear. According to Husserl (1989:19), a structure is an abstract model of organisation including elements and the law of their composition.

In neo-structuralism, the structural schemata of kinship relations or creation myths are adduced as hypotheses that allow anthropologists to explain the diversity of human practices and beliefs. In this way, empirical diversity is subsumed under an epistemic totalisation provided by structures that fall under the category of universal constituents of the human mind and stabilising themselves between nature and culture. For that matter, kinship, for instance, constitutes one structure that leads to other structures, and vice versa. In Lévi-Strauss' model, society is presented as being constructed of like and unlike segments. These segments must be integrated to create mechanical or organic solidarity. Hence, this conceptual solidarity may best be achieved by setting up a structure of reciprocity. This is a system of exchange that binds the segments in the alliances (Kuper, 2006:76).

Consequently, those exchanges may involve one of the three channels, goods and services, language and symbols and the super gift, women (Lévi-Strauss, 1963:18). For the purpose of this study we may add indigenous knowledge on the list of the media of exchange. Neo-structuralism, therefore, is to be understood as the analytical tool for

explaining the solidarity between different cultural traits. Thus, the nature and extent of the exploitation of the environment is dependent on the way natural resources are tied to other aspects of behaviour of the community operand in that environment.

2.4.2 Relevance of neo-structuralism to the study

Culture is the most important concept in anthropology. That is the reason why it is no accident that anthropology has always been keenly interested in cultural survival. Though, this cultural survival must be tied to ecological survival. Simultaneously, it must be borne in mind that 'ecological survival' is a large scope of inquiry. That is why, according to Harries-Jones (1992:159), the major ecological concern is to define and explain all means of conserving life's margins. And accordingly, it appears to be the new evolutionary question. In order to take on this larger concern, Harries-Jones (1992:159) proposes that anthropologists will need to alter their perspectives of inquiry.

Likewise, if culture is to be maintained as the focus of anthropological analysis, then anthropologists need to readjust the sort of borders we define as cultural. Without doubt, the environment and the resources found in this environment have to be brought into these borders. And this applies to local knowledge about the environment as well. This forms the foundation of the neo-structuralist argument about conceptual representation of events, experiences and objects in the human mind.

In neo-structuralist thinking, ecological survival requires anthropologists to observe a much larger system and recognise that they are part of this expanded system. Ecological survival, consequently, is a cultural concept. It is an epistemology at a much broader and deeper level than the "green plans". This is because the green "plans" accentuate economic thinking in the realms of energy flow, work and cost-benefit environmentalism; the basis of what has come to be known as sustainable development. To think ecologically, in the conceptual framework of this study, the very rudimentary requisite condition is to get rid of this economist triangle.

Yet, anthropology has had the same set of economic assumptions as the rest of social science in the discussion of ecology. However, there has been an interesting difference in the way these assumptions are treated. For example, beliefs are treated in relation to the

environment in the same way in which kinship systems are analysed (Harries-Jones, 1992:159). Levi-Strauss provides a summary of kinship systems but focuses on the fact that kinship systems are about the exchange of women, defining the categories of potential spouses and prohibited mates (Moore, 2009:238). For Levi-Strauss, marriage is a dramatic encounter between nature and culture. When we link ecology to the presentation of myth and belief system, they merge such as in Lévi-Strauss' discussion of totemism (Lévi-Strauss, 1963:20).

Nevertheless, the current study recognises that the environment is much more than a set of material possibilities to which cultures, social organisations and kinship systems adapt. The study also recognises that the structure of the biosphere is such that it is comparable to a very large communication system respective to the fitness of its integrated cycles. Communication regularities should, in this case, be organised, albeit they cannot be considered as thought out in the economic sense of the word. There is referencing up and down, a hierarchy, which can be glimpsed through alternatively as variations or patterns.

From there, to understand the non-linear characteristic of natural ecosystems such as mangroves, fisheries and corals, we can then build this understanding into an ecological epistemology (Bateson and Bateson, 2004:12). In the process, the relationship between nature and culture, through indigenous knowledge, becomes that of a structural system. However, this system is loosely coupled in contrast to the dualism of the economist orientation. The inference is that, changes described as adaptive, are actually organisms themselves and their environment to preserve and stabilise that relationship through patterns and variations.

This is the basis of lived experience. This experience is integrated in a coherent system of symbols that both renders the world intelligible and seems uniquely suited to do so (Ericson and Murphy, 2008:163). We can then go further and postulate that indigenous knowledge is part of this symbolic system in the sense that it is epistemologically grounded in the assumption that humans are animals suspended in webs of significance that they have spun themselves. The study of the relationship between culture and nature is, therefore, not an experimental science in the search of laws and facts, but rather an interpretive one in search of meaning. The meaning we are looking for is not locked in

the minds of individuals, but in the network of significations that are on public display, through belief, practice and context.

In this way, indigenous management systems, through indigenous knowledge can be embodied as emerging from a multifarious structural system composed of three subsystems: context, practice and belief. Thus, indigenous knowledge as contextual knowledge is based on history, demographic factors and biophysical features of place. Indigenous knowledge as practice depicts meaningful action, through physical interaction and experiential learning. Knowledge as belief portrays the influence that spirituality, laws, norms and values have on how people act within their ecosystem.

At this point it would be prudent to introduce ethnography in support of a structural, though, non-materialistic conception of an ecosystem. Ethnographic methods provide a means of 'progressive contextualisation' (Vayda, 2006:615). In this study, the concept of contextualisation as an edifice of events and interrelated processes, fits well within the neo-structuralist approach to research. Ethnography is also seen as a means of viewing the 'process of knowledge production as constructive rather than descriptive' (Knorr, 1995, cited by Potter, 2005: 105). This particular view underpins the way the ecosystem is taken in the current study.

Therefore, the ecosystem is considered in this research as a complex system which provides a framework to approach natural resource management issues from an indigenous perspective. Basic principles of ecology are used as guidelines to build sustainable human communities (Capra, 2010:81) and these include 'interdependence', which is understanding relationships and represents a shift in perception from the parts to the whole, from objects to relationships, and from contents to patterns; and cyclical vs. linearity in terms of causal relationships between cultural norms and marine resources. We cannot ignore the concept of resilience (Holling, 1973).

Resilience in ecosystems is considered the 'ability' of an ecosystem to persist in the face of disturbance to state variables (Holling, 1973) or to deal with change and uncertainty (Gunderson and Holling, 2002:400). In this study, the term applies to the set of human-ecosystem interactions under consideration in the study, the culture-nature nexus, and the

ways in which biophysical elements of ecosystems are linked to cultural norms. This means that understanding ecosystem dynamics also requires investigating the spatial, temporal, thermodynamic, informational and cultural aspects of living systems and on knowledge of interconnections and past history (Kay, 1994; Kay and Schneider, 1994: 34).

The key to using the neo-structural approach in developing methods for this research was to seek relationships between variables in the data as well as to seek the synergy between the human world and the biophysical and to conceptualize the system as human interaction *within* the ecosystem, a conceptual framework in which aspects of social reality are united in a spatial and temporal perspective, through contextual, practical and belief-based indigenous knowledge. Neo-structuralism is, therefore, about the reproduction of social systems in terms of 'structure' and 'system', the linking of experiential learning to scrupulous management of mangroves, fisheries and corals. This is the basis of the *duality of structure*, as originally envisaged by Levi-Strauss (1963:23).

In the scheme of this approach, the relationship between the human and natural worlds should be viewed as a social process, in which a series of ongoing activities and practices that people carry out at the same time reproduce larger institutions. These are indigenous management systems which are self-organising in systems terms. Structure then becomes the properties (rules and resources) that allow for the binding of time and space in social systems that end up directing the relationship between indigenous knowledge and marine resources. In the final analysis we have a system that defines the structural relations between people's social practices and the resources found in their immediate environment.

This is the concept of the embedded character of indigenous knowledge as a starting point. The concept allows for examination of the condition of marine resources as a dependent variable that is impacted upon by indigenous knowledge as an independent variable. Therefore, the relationship between indigenous knowledge and the conservation of marine resources can be analysed by studying indigenous knowledge using time-space analysis as developed and described by Mendoza (2000).

As Mendoza elaborates, since the essence of neo-structuralist theory is concerned with relating the minute and the large-scale, the short-term and the long-term, presence and absence, it can be applied to local/indigenous knowledge in a global world. The presence of indigenous knowledge has influence on the management and conservation of mangroves, corals and fisheries in the Giriama community. This is because for the Giriama many elements of the biophysical environment are imbued with human characteristics. So the Giriama, through indigenous knowledge of the marine ecosystem, relate to these features of the ecosystem on a relational and personal level, making it less likely for the concept of nature to be viewed as separate from humans.

To create order out of complexity, indigenous knowledge is, throughout the study, analysed in terms of the dimensions of *space* and *time* and as a knowledge *system* arising from, and at the same time influencing, a complex of social (cultural, spiritual, and intellectual) and ecological (biophysical interactions) features of the marine ecosystem. The spatial dimension of IK is taken to be the holistic, embedded or 'place-based' aspect of knowledge, signifying the situatedness, at any one point in time, in the social, cultural, historical and biophysical aspects of locale or 'place'. Therefore, understanding knowledge as embedded in place in this study necessitates an understanding of the social norms, values, belief systems, institutions, and ecological conditions that provide the basis of 'place' where knowledge is derived. The temporal nature of IEK is the dynamic, changing and evolving element of knowledge as it adapts to and influences changing socio-ecological contexts.

The context-practice-belief (CPB) complex is place-based, emerging from reciprocal relations of human-ecosystem interaction. The use of the CPB complex as an epistemology of the local knowledge system is intended to assist greater understanding of the myriad of ecosystem variables that influence knowledge construction. The assumption made here, then, is that if the CPB framework is used to understand how people 'come to know', then understanding local epistemology will assist in developing sustainable resource management options. Context, practice and belief are the independent variables which provide an emergent cognised model of the environment and the resources as an intervening variable. This then produces indigenous knowledge of the marine ecosystem, indigenous taxonomy and indigenous management systems as dependent variable. This

will lead to the involvement of the local community, through the application of their indigenous knowledge in the sustainable management of marine resources. This relationship can be conceptualized as shown in Figure 2.1.

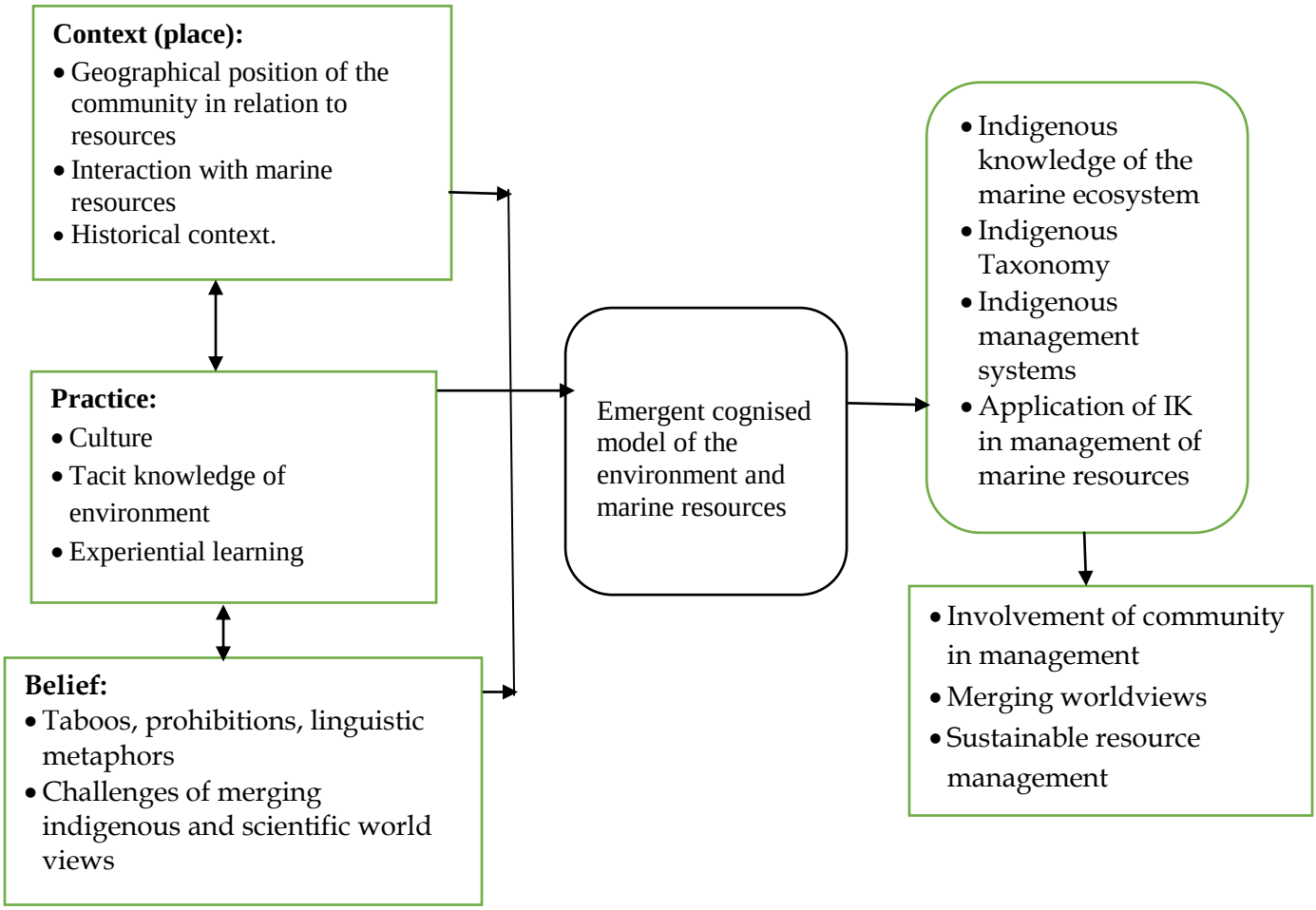

Fig. 2.1: Conceptual Framework. *Source: Originally from WOODLEY (2002) but modified to suit the study*.

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter is divided into two parts. The first part deals with the description of the research site, its physical environment and resources ethnography, demographic trends and livelihoods. The second part dwells on the study design and this entails the sample selection, data collection methods, pre-testing and data processing as well as analysis.

3.2 Research Site

3.2.1 Location and size

The study was carried out in the area between Kisauni in Mombasa County and Matsangoni in Kilifi County (Maps 3.1 and 3.2). Mombasa County is situated in the south-eastern part of Coast Region. Mombasa borders Kilifi County to the north, Kwale to the south and west and the Indian Ocean to the east. The county lies between latitudes 30’ 80” south and 40’80” south and between longitudes 39’ 60” east and 39’ 80” east (Republic of Kenya, 2014). Kilifi is located north of Mombasa. The county is situated at 3.63° South latitude, 39.85° East longitude. It is bordered to the south by Mombasa County, to the southwest by Kwale County, to the east by the Indian Ocean, to the north by Tana River County and to the west by Taita-Taveta County.

In Mombasa, the study site included villages in Kisauni and Bamburi, while in Kilifi County, it was done in in Shanzu, Mtwapa, Kanamai and Matsangoni. These are areas where people live in close proximity to the marine resources. As such these people are intimately related to the marine resources. This is because they are involved in the extraction of the mangrove, coral and fishery resources. Since they have long periods of engagement with the resources, they have developed techniques that are dynamic in the relationship with the mangroves, fisheries and corals as well as coral reefs.

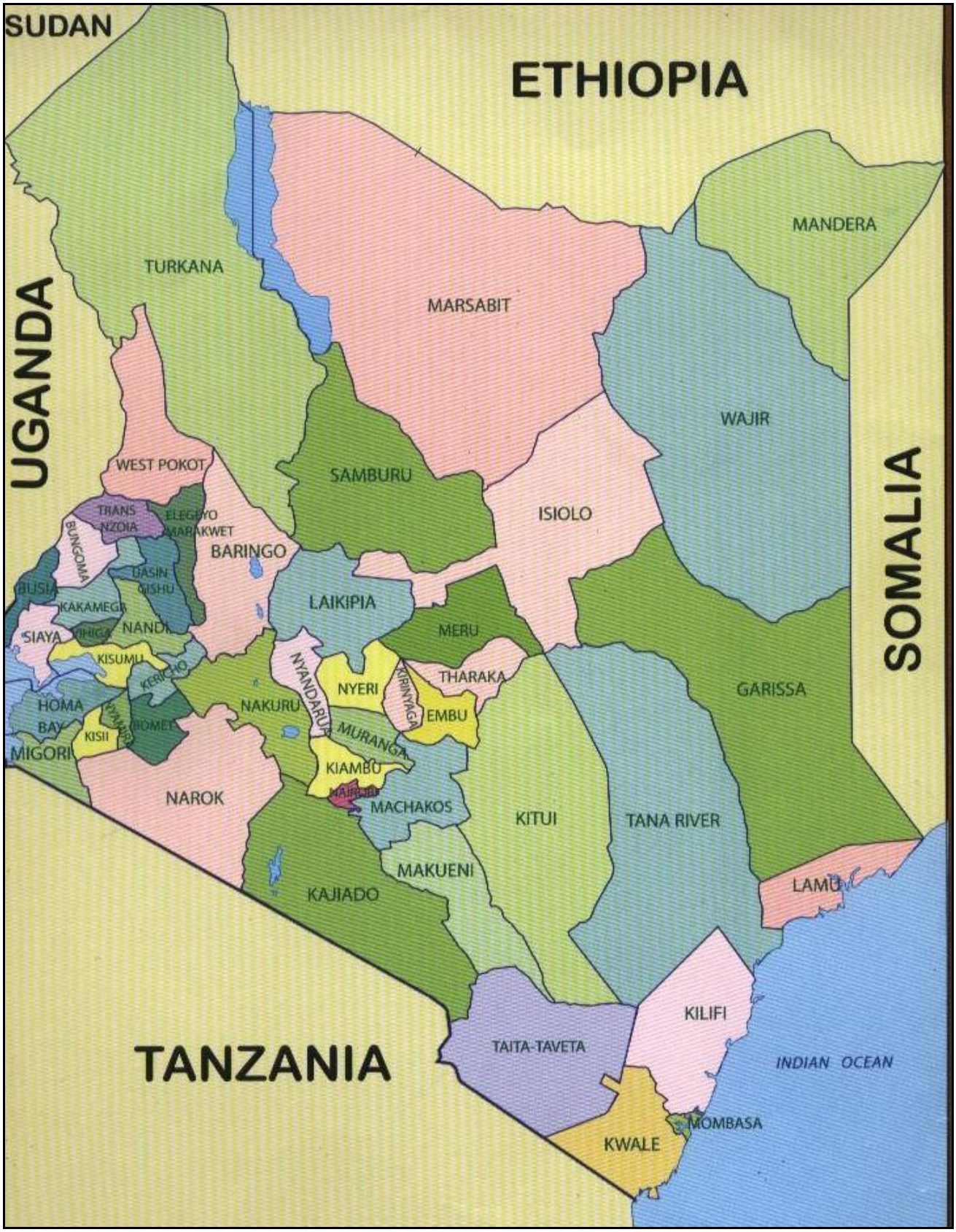

Fig 3.1: Map of Kenya showing counties. Note the location of Mombasa and Kilifi Counties (Source: GuidetoKenya.com)

Fig 3.2: Map of the Research Site (Source: Department of Geography and Environmental Studies, University of Nairobi)

3.2.2 Ethnographic profile

The Giriama, who are a sub-group of the larger Miji-Kenda community, predominantly inhabit the research site. Miji Kenda literally means "Nine villages". These are the traditional homes of Wadigo, Wagiriama, Wakauma, Wachonyi, Warabai, Waduruma, Wakambe, Waribe and Wajibana (Mwangudza, 1983:10). Apart from the Giriama, the area is also occupied by smaller groups of other Miji-kenda communities, other coastal communities such as the Bajun, Waswahili, and Arabs as well as immigrant communities from inland Kenya. The last groups include Abaluyia, Agikuyu, Luo, Akamba, Abagusii, Kalenjin, Maasai and Samburu (Republic of Kenya, 2014).

The Giriama and the other eight groups of the Mijikenda groups live near and among each other. Over time the group has assimilated modern culture for both trade and beliefs. Today many of the Giriama are either Christian or Muslims due to missionary activity. Despite this, they still practise many traditional rituals honouring their ancestors, but are very familiar with modern life. They raise cash crops to sell at local markets and trade for modern goods. They also practise fishing and mangrove cutting.

This community is patrilineal and patrilocal. Inheritance is through the father's lineage. The head of the household is the eldest living male and inheritance follows to his eldest son. That is only partially true because the eldest son shares the responsibility of the land with his brothers. Since all work the land they each share in the harvests equally. Parent-offspring interactions must be excellent since so many people live together in the same houses. All members of the family must know their place in the chain of command and exist only there. Parents have a large amount of control over their children because they believe in the parent curse. This is where the parent can curse the child at any time with infertility. The curse can only be lifted once the child admits to their misgivings and the parents are happy (Mwangudza, 1983; Gachihi, 2012).

The Giriama people adhere to a non-centralised government based on a council of elders called the Kambi. The council is derived from age-sets. Age-sets and secret societies preside over the affairs of the community. There is one secret society for women known as Kifudu, who keep clay pots that stand for ancestresses in a thatched roofed hut. These pots are in the control of post-menopausal women, who are healers and are also in control of fertility in the entire ethnic group as well as communication with the ancestors. To honour them, the women take the pots from the shrine, bring them to the centre of the homestead, and "play" them —by putting their mouths in the openings of the pots and blowing. Without the women performing rituals centring on these clay pots, the Giriama believe that young fertile women will have problems in childbirth (Gachihi, 2012).

The Giriama have five male secret societies, the main society being the Gohu society, which is a fraternal organisation for wealthier-than-average men. You have to be elected to membership and this requires giving a bull. The key feature of the Gohu society is how they honour their members when they die. Men in the society are skilled carvers and are

paid to create the *kinyago*—a memorial statue —for the dead Gohu member. The posts, which range from four to nine feet tall, are created from indigenous termite-resistant hardwood. They consist of a circle for the head and rectangle for the body, and vary in decoration. *Vinyago* are placed around the edge of the homestead, but they are not the sole monuments (Gachihi, 2012).

Other uncarved wooden statues, called *koma*, are raised in honor of non-Gohu members and occupy the middle of the homestead. These smaller statues are erected in a clear space that is surrounded by homes. People are buried right next to their houses, so these statues do not actually mark the graves. However, even these ordinary statues play a role in the daily lives of the Giriama. When they drink palm wine, they pour a few drops on the ground in front of the statues and say a few words to the ancestors (Gachihi, 2012).

In this community, what counts as real knowledge about the natural world is determined by those classes of people that possess authority to shape and control knowledge itself. Thus, knowledge among the Giriama is primarily a way of naming and ordering the world that is in the custody of the powerful experts. These are the individuals or groups that are accredited to participate in institutions that help to maintain social order in the community. They are specialists such as mangrove cutters, healers, and fishing expedition leaders. Through age-sets, they preside over sacred ceremonies and rituals. The ceremonies relate to birth, naming, initiation, marriage, initiation into secret societies and death. There are also functions within the society which are central to livelihood such as farming, fishing, healing and mangrove cutting. These ceremonies are presided over by the elders who are believed to be under the guidance of ancestors and benevolent spirits. To be selected a leader or participant in any of the ceremonies or rituals one must demonstrate deep knowledge of function at hand (Gachihi, 2012).

This knowledge is a function of long periods of apprenticeship and experiential learning, and is passed down from father to son or elder to a chosen heir according to the wishes of ancestors. Some young people are chosen by ancestors by experiencing a trance or summons in dreams and visions (Gachihi, 2012).

What comes out of this ethnographic profile of the Giriama is that individuals and their interrelationships are determined by discourses of power, through experiential knowledge and practice. The same individuals and social arrangements are creations of human agents who assemble the community's culture through practice and praxis. What the Giriama do in the mangroves, farmland or the sea in practice is to create, reproduce and change a variety of taxonomies that are the basis of social relations such as marriage and leadership.

Fishing and mangrove harvesting are major livelihood activities among the Giriama. Time spent in fishing cultivates intimacy and harmony with the ocean, reinforcing strong ties to specific places and close relationships with marine creatures that are a part of Giriama identity and spirituality. The most significant beliefs and values in Giriama culture revolve around three fundamental relationships. One is the relationship between people and their local environment. The second is the relationship among humans and third the relationship between people and their ancestry.

The importance of the first two relationships stems from the community's dependence on one another and on the environment for survival. The third relationship demonstrates the belief that those who came before knew the correct and proper way. The traditional practices of the Giriama in regard to the natural resources in general and marine resources in particular are guided by cultural protocol. This protocol combines knowledge, practice, and belief, fundamental characteristics that evolve over time within this cultural and ecological context. Protocol disciplines and brings responsibilities to fishing, mangrove and coral harvesting as well as to other cultural activities.

3.2.3 Climatic conditions

The research site lies within the coastal strip in the hot tropical region where the weather is influenced by the monsoon winds. The total annual rainfall ranges between 1025 and 1270 mm, with a mean of 1100 mm. The rainfall pattern is characterized by two seasons, which correspond to changes in the direction of the winds (Republic of Kenya, 2015). The long rains occur between March and June, with 60% reliability. The annual rainfall amounts to about 1100 mm (Republic of Kenya, 2014). December, January and February are the hottest months, while June, July and August experience the lowest temperatures.

The minimum and maximum temperatures are 22.7 degrees Celsius and 33.1 degrees Celsius, respectively (Republic of Kenya, 2010). The annual mean temperature is 27.9 degree Celsius, with a minimum of 22.7 degrees and a maximum of 33.1 degrees. The average humidity is about 65% (Republic of Kenya, 2015).

3.2.4 Physical environment and resources

The research area is a coastal lowland with extensive flat areas rising from 8 metres above the sea level in the west. It has three physiographic belts. The first is the flat coastal plain, which is approximately 6 kilometres wide and includes the island, Matsangoni on the main land and Mtongwe in the south. The second consists of the broken, severely dissected and eroded belt, overlain in places by a residual sandy plateau. The belt covers Changamwe area. Lastly, there is the undulating plateau of sandstone found in Kisauni and Shanzu (Republic of Kenya, 2014). It is worth noting that the research site has no permanent rivers; nevertheless, due to the nature of the rock structure, the water table is high. Also, due to low altitude and coastal location, the area experiences climatic conditions, which vary from those of inland areas.

The only gazetted forests in the area are the mangroves. These grow in the shallow swampy areas along the creeks. However, a little agro-forestry is practised on private land. The mangrove forests do fall indirectly under the jurisdiction of the forestry department (Republic of Kenya, 2015). These forests cover a substantial area in the research site. Mangrove trees are used in house construction, boat building and as firewood. The government uses them for fibre optic and electricity poles. The mangrove forests also function as spawning sites for various marine animals (Shilabukha, 2000:46). There are about six species of mangroves, two of which have outstanding value. Of the two, *Rhizophorous mucronata (mkoko)* is used for construction and *Ceriops tagal (mkandaa)* has medicinal value (Shilabukha, 2000:37).

The research region has several historical sites, which serve as tourist attractions. These are the beautiful sand beaches have attracted the development of world class hotels (Republic of Kenya, 2014). Much as the area does not have game reserves, it has some protected areas. These include the Marine National Park and Marine Game Reserve. The

flora and fauna found in these parks include fisheries, corals, seas grass beds and the reef. Then there is the marine link in the ocean organisms (Republic of Kenya, 2015).

It is also notable that some wildlife is found in the mangrove forests. Among such wildlife are wild pigs, monkeys, lizards and snakes. These form part of the local and foreign tourist attractions. Tourism is, thus, a major income earner for the people of the area (Republic of Kenya, 2014).

3.2.5 Livelihoods

The area is close to the waters of the Indian Ocean with a coastline stretching from Ngombeni in the south to Matsangoni in the north. The area has over 65 square kilometres of open water, plus access to potential fishing zone, which is 2,002 kilometres long (Shilabukha, 2000:34). Fisheries enjoy a significant position in the economic sector of Giriama people. Artisanal fishers have operated along the continental shelf for centuries. It is expected that coastal communities will continue to depend on fisheries for a long time to come (Republic of Kenya, 2014). Apart from fisheries, commercial farming of coconuts and cashew nuts is undertaken, especially in Kisauni. Cassava is also grown on a small scale for domestic consumption in Kilifi County (Republic of Kenya, 2015).

3.3 Study design

This study was cross-sectional, descriptive and exploratory in nature. It was carried out between June 2012 and December 2013, and employed qualitative methods of data collection. It was conducted in two phases, with frequent field revisits to clarify emerging issues from the data already collected and analysed. The first phase involved identifying villages, households and individuals. This facilitated the listing of households for sampling. After this, informal interviews and some key informant interviews were conducted with elderly people, opinion leaders and indigenous environmental experts.

The purpose of these interviews was to gain insights into local perspectives on marine resource management. During this phase, general information about the community's perceptions, knowledge and local nomenclature especially regarding the concepts of the environment, natural resources and marine resources, was gathered. At the same time,

some key informant interviews and focus group discussions were conducted. During the second phase, the rest of the key informant interviews, in-depth interviews and focus group discussions were conducted. Secondary data collection entailed perusal of published and non-published material such as books, book chapters and journal articles and reports, as well as both hard and online copies. This was an on-going exercise in the course of the study.

Quantitative data such as age of the respondents, marital status and the number of years spent on interacting with resources were analysed through computing averages such as the mean, range, mode and percentages. These were then presented through descriptive statistics such as frequency distributions and tables. Qualitative data analysis was done through content and thematic analysis. This entailed the cyclical process where data collection was done simultaneously with data analysis, that is, reading, rereading, intuiting, analyzing, synthesizing, and reporting on the data. This was done by exploring the various dimensions of indigenous knowledge as it relates to mangroves, corals and fisheries and sought explanations on how, when and why indigenous knowledge on marine resources related to age, gender and indigenous occupations.

3.4 Study population and unit of analysis

The study population included all individuals from the Giriama community aged 18 years and above living in the research site. The unit of analysis was the individual Giriama aged 18 years and above residing in the study site.

3.5 Sampling strategy

The research site was chosen for the study on the basis of its geographic location and adjacency to the marine resources under consideration. Kisauni is located in the southern part of the research site where there is considerable urban influence and multi-cultural composition of residents, while Matsangoni is situated in the northern part of the site where the residents are mainly Giriama. Mangroves, corals and fisheries feature predominantly in the subsistence livelihoods of the people of the research site. Therefore, sampling for in-depth interviews was multi-stage. The site was divided into villages along a continuum, then respondents were randomly selected for the interviews. However, the inclusion/exclusion criteria were membership of the Giriama community and proximity to

the resources. For the in-depth interviews, 25 men and 15 women were interviewed. For the FGDs sampling was purposive while key informants were sampled by intensity sampling. In this case, specific groups within the community were targeted, including healers, fishing expedition leaders, mangrove cutters and community leaders.

3.6 Data collection and data collection methods

The study was carried out between June 2012 and December 2013. It involved intermittent stays in the community for long periods of time. The research team comprised myself as the chief investigator, assisted with three local research assistants. One of the assistants had graduated from the University of Nairobi, while the other two were students of the university at that time, undertaking their first degree. While collecting data collection on indigenous terms marine resources, we used local interpreters. The research assistants being local, are fluent in Giriama language. The language's intelligibility with Kiswahili made it easier to seek clarification in the latter language. Data collection methods are presenter in the succeeding subsection. They included in-depth interviews, focus group discussions, key informant interviews, transect walks, observation methods, informal interviews and secondary sources.

3.6.1 In-depth interviews

There were 40 in-depth interviews, which involved local people with general knowledge about ecological conservation. The interviews obtained both qualitative as well as quantitative data. Examples of the former entailed age, marital status and the length of time the respondent had lived in the village. On the qualitative side, the interviews took historical perspectives on the management of the marine resources in the area under study and the changes which have taken place in the course of the time trajectory. The interviews examined the Giriama perspectives on the environment as well as marine resources and the various aspects of the environment such as the physical and ritual classification of marine resources.

In addition, these interviews explored special indigenous knowledge about the resources and how the knowledge is being applied to the current management structures. Finally, the interviews tried to find out the convergent and divergent perspectives of different indigenous experts in the management of the resources in the area. The researcher used an

in-depth interview guide (Appendix 1) to conduct the interviews. The mode of interviews was face-to-face.

3.6.2 Focus group discussions

There were six focus group discussions for men and women and these were held to grant the study an opportunity to revisit emerging issues without necessarily going back to the same respondents. Each group consisted of 8 to twelve individuals. Three FGDs for women were undertaken at Kisauni, Bamburi and Matsangoni, while the men's FGDs were undertaken at Shanzu, Mtwapa and Kanamai. The issues taken up in the discussions were in regard to special knowledge about the various aspects of marine resources. The discussions also aimed at gaining insights into awareness of the local nomenclature, taboos and other beliefs about the marine resources. This method of data collection facilitated the study to obtain consensus on the issues discussed. A focus group discussion guide (Appendix 2) was formulated to guide the discussions. The sessions were moderated by one person and a note taker.

3.6.3 Key informant interviews

There were 15 key informant interviews, which captured information through a key informant interview guide (Appendix 3). These involved face-to-face conversations with individuals with specialised and expert indigenous knowledge about the situation of managing marine resources from the perspectives of the Giriama people. These experts included local community leaders, fishing expedition leaders, healers and mangrove cutters as well as KMFRI, KWS and Kenya Forest Service offices. The interviews were used to capture information on indigenous nomenclature, taxonomy, species distribution and regeneration, weather patterns and seasonal indicators. This kind of information could not be obtained through in-depth interviews and FGDs.

3.6.4 Transect walks

Transect walks are referred to as 'community-based environmental assessment' (IUCN, 1997: 162). The function of transects in this research was to triangulate methods to substantiate the in-depth interviews and to provide an 'in context' setting for ecological description. The transect walks consisted of walking with a number of different people in the community, including men and women of different age groups. The walk was through

one or more eco-zones, moving inland from the village to the mangrove forest or the sea, in a roughly perpendicular line to the inland areas. This method was used as an *in situ* forum to hear information about local understanding of the habitat, indicator species, regeneration cycles, the uses of plants, and other animal/human-plant interactions within the ecosystem, including the perceived impacts of human, that is, mangrove cutting or pollution activities within the local ecosystem. It also provided a forum for questions relating to management and user rights. The walks were incorporated into one hour or half day sessions that involved walking in the mangrove forests, towards the sea, plant and animal species collecting, visiting sacred sites in the forest or walking to another village. Mental maps of resources were constructed and reproduced on paper (Plate 3.1).

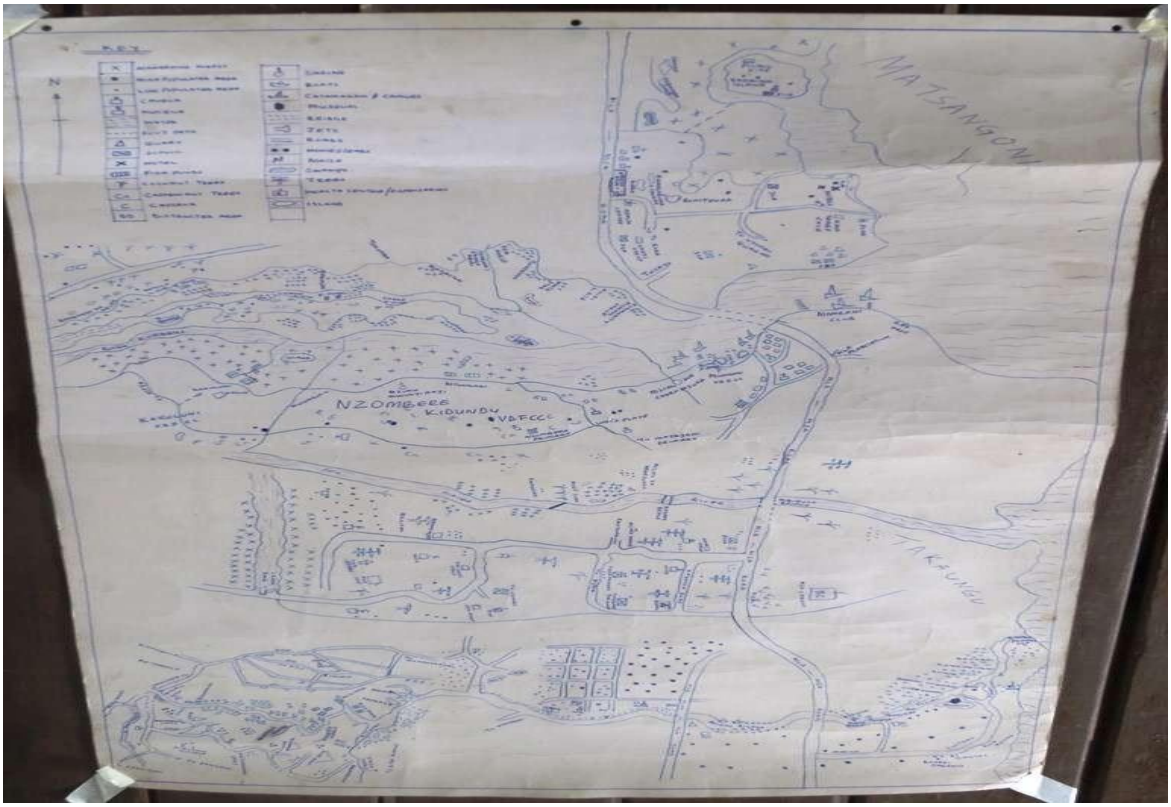

Plate 3.1: Transect map of Matsangoni as drawn by locals and the research team. *Source: Author' 2013.*

During the walks, I sought information relating to indicator species, behaviour and abundance of flora and fauna, fishing techniques, location of different fish and mangrove species, as well as causes of degradation and depletion in certain locations. Information on local animal and plant names as well as use was obtained for the purpose of gaining insights into the level of dependency on and knowledge of the ecosystem. The

information was collected using field notes, a check list (Appendix 4) and a still picture camera.

3.6.5 Observation and informal interviews

The purpose of these methods was to gain general insights into local *vis-a-vis* pragmatic perspectives on marine resource management. These methods were applied throughout the lifespan of the fieldwork. The purpose was to fine tune the questions especially for the key informant interviews and the focus group discussions. They also helped confirm or corroborate information obtained from in-depth interviews. These methods were employed to collect information on the community's perceptions, knowledge and local nomenclature especially regarding the concepts of the environment, natural resources and marine resources. Similarly, observation facilitated the researcher to gain insights into resource use patterns, time investment, resource ecology, fishing techniques, vessel-anchoring and recreation activities. Informal interviews were based on field notes, while observation was based on a checklist Appendix 4).

3.6.6 Secondary sources

These sources of data were reports, journal essays, internet sources and book chapters related to marine resource management. Collection of this information was continuous throughout the course of the study. This information formed the basis for literature review and identification of the gaps. The information also facilitated the formulation of the research questions, objectives and assumptions as well as the theory used to guide the study.

3.7 Pre-testing

The in-depth interview guide was administered to a few selected individuals, to identify mistakes in advance and correct them promptly. In addition, the pre-test was meant to portray the picture of what is to be expected in the field.

3.8 Data processing and analysis

Most of the data processing and analysis was carried out on a daily basis in the course of the fieldwork. This study employed various techniques of data analysis. For socio-demographic data analysis was done through computing averages such as the range, mean

and percentages. They were then presented through descriptive statistics in the form of frequency distributions and tables.

Qualitative data analysis was done through content and thematic analysis. They were transcribed, coded and analysed according to themes and content of emerging issues. The information obtained was coded, then categorised according to the major themes which emerged in the course of the study. In the course of the analysis, anecdotal references and personal experiences which revealed discernments into the major questions of the study were categorised together. Consistencies and discrepancies from key informants and focus group discussions were recorded and whenever there was any doubt in the information provided, elaboration was sought. This then necessitated field revisits to corroborate information that was deemed insufficient or inaccurate.

3.9 Ethical considerations

The researcher did not expect any psychological or physical harm to the participants in the study. However, it was anticipated that some of the participants might not be comfortable with certain questions. To minimise this risk, research assistants were trained on data collection methods and on how to probe any sensitive issues that might emerge in the course of the interviews and discussions. Their training emphasized how to introduce the study and its objectives as well as to establish good rapport with the participants. The training also covered interviewing techniques as well as the importance and need to assure and maintain confidentiality. The research assistants were also made aware of the need to inform respondents and participants that they did not have to respond to questions they were not comfortable with. Finally, the research assistants were trained on issues of ethics in regard to human subjects of research.

On top of this, the prospective research subjects were recruited on a voluntary basis and provided with information about the study before any consent to participate was sought. The subjects were adequately informed about the aims and objectives and the institutional affiliation of the study. Furthermore, the subjects were informed about their right to abstain from participating in the study, or to withdraw from it at any time, without reprisal and the measures to ensure confidentiality of information guaranteed.

As part of academic and professional ethical considerations, the study findings will be disseminated in a number of ways. One way will be to publish a book chapter or a journal article. This will provide fellow scholars and other professionals interested in the study findings to have a chance to comment and provide feedback. Another way will be to share the findings with the local community in the form of a pamphlet or booklet on nomenclature and taxonomy of the species in both Kiswahili and Giriama language.

CHAPTER FOUR

INDIGENOUS KNOWLEDGE AND MARINE RESOURCES

4.1 Introduction

This chapter presents findings on the structure and significance of indigenous knowledge on marine resources. The chapter first presents the demographic and background characteristics of the respondents. Then the presentation delves into the distribution and composition of indigenous knowledge among the respondents. The presentation looks at the structure and significance of indigenous knowledge in relation to the physical marine environment.

4.2 Characteristics of the respondents

Among the background characteristics captured were gender, age, marital status and occupation of the respondents. Age is an important indicator of the level of knowledge on the marine resources while occupation is important in regard to the **sc**ope of interaction of the resources. Age is also important because it is one of the factors that determine the position of leadership of fishing expeditions and other activities in the sea and mangrove forests. In the case of occupation the intention was to capture both formal and informal utilisation and management of the mangroves, fisheries and corals.

Gender was one of the variables that were important in the study because it may provide information on which resources are utilised by men and which resources are utilised by women. Apart from that, we can also infer which resources men or women are most likely to be knowledgeable about. Table 4.1 summarises the number of men and women who were interviewed for the in-depth interviews.

Table 4.1: Distribution of the respondents by gender

Gender	Frequency	Percentage
Men	25	62.5
Women	15	37.5
Total	**40**	**100.0**

Source: Author, 2013

Age and the years of interaction with resources was also an important aspect of the study since one of the objectives was to analyse the local knowledge on the marine resources. The age of the individual will naturally determine how long the individual has interacted

with the resources and is a proxy measure of the amount of knowledge the individual has accumulated about the resources. Table 4.2 summarises the information regarding age of the respondents.

Table 4.2: Age distribution of the respondents

Age Group (In Years)	Frequency	Percentage
20 - 30	6	15.0
31 - 40	11	27.5
41 - 50	13	32.5
51 - 60	7	17.5
61 - 70	2	5.0
71 and above	1	2.5
Total	**40**	**100.0**

Source: Author, 2013

As Table 4.2 shows, the respondents ranged in age from 21 to 70 years. The age difference was greatest among the men compared to women. The oldest man was aged 73 years while the youngest was 22 years old. For the women, the oldest was aged 52 years, while the youngest was 34 years old. On marital status the summary is presented in Table 4.3.

Table 4.3: Marital status of the respondents

Marital status	Frequency	Percentage
Married	32	80.0
Widowed	6	15.0
Divorced	2	5.0
Total	**40**	**100.0**

Source: Author, 2013

As Table 4.3 indicates, the majority (80%) of the respondents were married while slightly below a fifth (15%) were widowed. Only 5% were divorced. This is an indication that this community values the institution of marriage, and does not encourage divorce.

The study also sought information on the length of time the respondents had spent interacting with the resources. From the in-depth interviews, the period the respondents had lived in the village ranged from 10 to 70 years while time taken to interact with the resources ranged from 5 to 47 years. As Table 4.4 indicates, the longest time spent in interaction with the resources was among mangrove cutters and fishers. The person with the longest period of interaction with marine resources had done so for 47 years.

Table 4.4: Period of time spent working with resources

Response	Frequency	Percentage
<1 year	4	10.0
1-10 years	5	12.5
11-20	8	20.0
21-30	11	27.5
31-40	10	25.0
41-50	2	5.0
Total	**40**	**100.0**

Source: Author, 2013

One of the male elders interviewed had this to say:

> *I am now 72 years and I have grown up fishing since I was 15 years of age. I have practically lived in the sea all my life. The sea is like my home, I know all the corners and the nooks, the fish know me and they come to me.*

In regard to religious affiliation, Muslims comprised 54.6% and Christians comprised 42.3% while those who were not affiliated to either Christianity or Islam constituted 3.1% of the respondents. These described themselves as Africanists.

The knowledge of the resources also has to do with the occupation of a respondent. The respondents had different occupations as rain makers, fishing expedition leaders and those who perform rituals of environmental nature. Some of the respondents had multiple roles in taking care of the marine resources. In regard to gender division of labour, men are allocated duties in fishing in the deep sea, lagoons and mangroves. They use hand lines, canoes and nets. Men are also responsible for cutting mangroves for boat and house construction. Male expedition leaders and healers are responsible for carrying out rituals related to mangrove cutting or fishing. Women are responsible for gleaning. They pick those species found near the shore or shallow waters. Women are also healers who go for herbs and roots in the mangroves.

Those who cut mangroves are also well-versed with information and knowledge on the species and their characteristics. They know a lot about the distribution of the species in the area. One of the male mangrove cutters, aged 68 years and who also doubled as a healer informed me that he knows a lot about the resources owing to his long experience in interacting with the resources. According to him:

> *These trees are like my relatives; we interact at the personal level, and we sing and sway together.*

The findings also indicate that men spent more time with the resources compared to women. This may be attributed to the gender roles and ritual occupation of the public and private spaces in the community. In this community men spent more time out-doors compared to women. The gender roles of cutting mangroves, building and fishing are part of the public domain activities. According to one of the respondents: male elders, aged 65 years:

> *The work of men is to look after their families and provide food. Therefore, you will find it is men who go fishing in the deep sea and cutting mangroves. Also men make the fish nets and traps. It is not good for women to go into the deep sea for fishing or venture into the mangroves. But women whose uteruses have finished their work can venture into the mangrove forests looking for herbs to heal those afflicted by various ailments.* [Male, 65yrs, Mtwapa, KII].

This perspective was corroborated by another respondent thus:

> *The mangroves are important to us. They provide us with medicine, firewood and shade for the mirindi, which women collect. Young women can only collect mirindi and firewood and only those who are trained in medicinal herbs can access the trees with medicinal properties. Remember those trees with medicine are property of the ancestors and ancestors can only talk to those who are invited to the trade. Among us women, it is those who no longer menstruate; they have stopped giving birth.* [Female, 60yrs, Matsangoni, KII].

The Giriama, according to the respondents, inherited valuable knowledge from their ancestors. This knowledge is critical for physical survival. The ancestry of experience stored in the memories of the Giriama is still transmitted largely through non-written processes. It is taught to succeeding generations by telling stories, creating relationships, and establishing personal meaning. Ancestors are revered because of the dependence on knowledge and skills passed from generation to generation. Time spent in fishing and mangrove-cutting cultivates intimacy and harmony with the ocean and the forests, reinforcing strong ties to specific places and close relationships with marine creatures that are a part of Giriama identity and spirituality.

4.3 The nature and significance of indigenous knowledge for marine resources

Indigenous communities have evolved different notions of the natural world in ways that suit them and their particular contexts. This means that different communities have different traditions of environmental knowledge. Their perceptions and knowledge are in part shaped by their values, worldviews, and environmental ethics. Cosmology and indigenous belief systems are the very foundations of this epistemological evolution in

the broader sense. In the Giriama community, the natural world is considered sacred and the property of the Supreme Being locally called *Mulungu*. Accordingly, in the exploration of environmental ethics and culture in Giriama society, the examination and analysis of the nature and significance of indigenous knowledge in shaping an ecologically sustainable society brings out this deep knowledge. According to information from the men's FGD in Kanamai:

> *The land and all the resources on it belong to Mulungu (God). He directs how the resources should be used. These resources are not just for us. They are for everyone in the world. You know some resources are sacred. We have mangrove forests, coral reefs and fish types which are not touchable. We inherit knowledge about the environment from our parents. This information is passed from ancestors. The ancestors are the custodians of this information and help us to know that the resources are not only for us but for even those who are coming after us. It is, therefore, good to take care of the resources properly.*

Discussions with many of the elderly respondents were streaked with nostalgia, bitterness and hope. The respondents spoke of the past with nostalgia. One male key informant at Mtwapa aged 67 years recalled the time when not only were the marine resources but the entire natural world was sacred. He had this to say:

> *We respected and worshipped the natural world. It was part and parcel of our kinship and friendship ecosystem. I am very worried about the alarming trends the degradation of the environment is taking and the depletion of resources, including disappearance of a whole type of animal or plant. I am not a lone, if you find out from others, they are generally discontented with the efforts of the current mandate to properly manage the utilisation of the marine resources. But we hope that things will improve if we are allowed to participate in the management of these resources. They belong to us, we shall suffer most of they are depleted.*

Knowledge of different environmental aspects was also demonstrated. For instance, the mangroves are generally referred to as *mikoko*, which is the local name for the most widespread and common of the mangrove species, namely, *Rhizophora mucronata*. The mangrove forests are highly valued in the community. The respondents revealed knowledge of the relationship between the mangroves, corals and the sea. Additionally, the durability and utility of the mangrove trees was also acknowledged. This knowledge, though, is stratified along the continua of gender, age and occupation.

The respondents also demonstrated empirical, meteorological and seasonal knowledge. Profound knowledge of the behaviour of the sea is a case in point. The local community has internalised the weather changes that influence the tidal schedules. One of the respondents had this to say:

> *Fishers and mangrove cutters work according to a natural tidal timetable. In case of changes, they have to wait for three days to a week before the new tidal schedule normalises and the sea settles down to welcome them back. This is important knowledge for that work in the sea, fishing or cutting mangroves. The fishermen monitor changes in climatic conditions by observing. For instance, dark, grey clouds which indicate the onset of rainfall, while increase or decrease in water temperature and change in the direction of wind indicate a change of seasons.* [Male, Majengo 54yrs, KII]

According to another respondent:

> *Climatic factors affect the way the community interacts with the marine resources. The major factors are rainfall, wind and temperature. During the rainy season, fisheries migrate from the deep sea to the shores. This is for cool temperatures, which are preferred by fish. This means fish species distribution is due to the temperature of the water. We also know that rainfall supports the existence of fisheries depending on the fish species. Some fish species such as pono appear most in rainy seasons while others appear when there is no rain such as simsim.* [Male, Kisauni 68 yrs., KII].

This was corroborated by KMFRI researchers in the key informant interviews. According to them, temperatures usually affect species distribution and migration in the sea. High temperatures usually bring most fish to the shores. One of them had this to say:

> *Wind direction helps fish locate their food and enemies and so contribute to species distribution, behaviour and migration. Wind direction enhances species security. Clouds also offer clues for interaction with marine resources. In monitoring the clouds, the community looks at the concentration of the clouds in the sky. It is very significant to monitor the cloud concentration as this influences the prospects of catching fish. Heavy cloud cover, known as kolowa, leads to the presence of many fish, which then means positive prospects for fishers.* [Male, Bamburi 45 yrs., KII].

According to the respondents, it is not only fisheries which are affected by the climatic conditions. Mangroves and corals are also affected by climatic factors. According to one of the cutters:

> *Heavy rainfall that carries soil and other rubbish to the mangrove ecosystem can lead to flooding. This will cover the breathing roots of the mangroves hence they finally die. Therefore rainfall can provide negative effects to mangrove forests. At the same time, strength of the wind affects the mangroves. Heavy winds break the branches of the mangroves which can be used for firewood. Temperature also affects the mangroves. High temperatures encourage evaporation to take place. This exposes the breathing roots of the mangroves hence they can die*. [Male, Shanzu, 42 yrs., KII].

This was corroborated by discussions with foresters and KMFRI staff. In agreeing with the observations of the mangrove cutters one KMFRI scientists asserted that:

> *Flooding from heavy rainfall can lead to floods that carry silt from the highlands to the lowlands through the process called surging. We also have garbage and other wastes, which are also carried to the mangrove ecosystem. This covers the breathing roots of the mangroves which makes them die. Therefore, rainfall can have negative effects on the mangrove ecosystem. The mangroves also suffer in high temperatures as these encourage evaporation and expose the roots.* [Female, Bamburi 38yrs., KII].

Corals are also affected by climatic conditions in various ways. According to the respondents this is because they are alive, and they breathe, grow and, finally, die. One of the male elders in Shanzu, aged 70 years, had this to say:

> *Heavy rainfall can lead to floods or increase the amount of deposition from the rivers. These depositions can cover the corals and kill them. Very high temperatures lead to evaporation of the waters hence exposing the soft corals. Exposed corals die.*

These findings indicate that the community monitors the climatic conditions that affect the resources. These climatic conditions are monitored in various ways. For instance, in monitoring rainfall, the community checks for certain signs and indicators. According to one of the fishers:

> *When corals change in appearance and become shiny it is an indication that heavy rainfall is on the way. The shedding of leaves by the mangroves and the appearance of certain fish species is also an indicator of heavy rain on the way. This also has prospects for catching fish and working in the mangrove forests.* [Female, Takaungu, 57 yrs. KII].

Wind patterns, especially wind direction, are also important as these influence the species distribution, migration and behaviours. Over time, the community has internalised a meteorological sequence that they do follow. This sequence has influence on the use of the resources. This is because fisheries are utilised according to the sequence of seasons. The fishing community has over the years known two seasons which affect the availability of species and the amount of catch. A men's FGD at Shanzu had this to say:

> *These seasons are the wet and the dry seasons. The species availability and catch differs in different seasons. Some species appear during the wet while others appear during the dry and others are all-weather. Generally, catch of the fish species is very high during the dry season.*

Other weather elements also affect the fisheries and mangroves resources and their regeneration. One other major weather element that affects the resources and their regeneration is sunshine. From the focus group discussions and in-depth interviews, it emerged that fisheries breed normally during the cool weather or season where there is moderate sunshine for the survival of the young fish. It also emerged that weather elements affect the regeneration of mangroves. In the men's FGDs at Mtwapa, it was revealed that:

> *During the cool season when there is limited sunshine, the ground on which the mangroves grow is very soft and wet. Therefore, some mangroves shed their fruits; these fruits are very sharp at the end facing down. On falling to the ground, these fruits penetrate the ground. After some time the seed inside the fruit starts germinating hence the regeneration of the mangroves.*

From the in-depth interviews and focus group discussions, it was evident that the sea is a very important area for the community. Chai Charo, a 40-year-old fisher at Kanamai in Kilifi County had this to say:

> *For a start this is the place where we extract food from. Therefore, every start of the fishing season must witness a ceremony for thanks giving*.

According to the respondent above, fishing in the sea is not undertaken all year round. It is seasonal. The fishing season begins in October and ends in April. The climatic conditions, especially the direction of the wind, are a factor to consider. The fishers have internalised these conditions. According to Chai Charo:

> *The south to north winds herald the beginning of the dry season, kusi. The fish swim along with these winds. When the winds change direction, the sea begins to change colour and becomes rough. The fishers know it is dangerous to go into the sea with the rough and high waves. This carries the message of the beginning of the wet season and therefore no fishing. The sea regulates the fishing in this way. The season is called kaskasi. Most fish are caught during the dry season when the water is calm and the waves gentle.*

However, there are some fish species that follow the cloudy conditions, for example, *simsim*. Much as these are a delicacy, the respondents indicated that they are also dangerous to follow. Mzee Mfuko of Mtwapa had this to say about this:

> *It requires expert fishers who know the sea maps to follow and catch them. The maps are dictated by the direction and strength of the winds. These dictate the path followed by water and that followed by humans.*

In predicting the tidal and weather changes, for instance, the colour of the seawater is very important. If the water is dark (described as dirty) and turbulent such that one cannot see beyond a few centimetres, it means that rain is on the way and no activities should be undertaken in the sea or mangroves. On the other hand, if the sea is clear and calm, it is safe to go fishing and mangrove cutting. These indications are also important for catch prospects. The colour green, according to older fishers, is a positive signal because it signifies "fertility" of the sea. This colour is due to the abundant presence of algae on which some fish species feed. According to one of the fishers:

> *The sea always appears "blue". This does not indicate barrenness. This is because some fish species such as papa (sharks and rays) are caught in blue looking waters. At times the prediction of weather changes enables people especially fishermen to look at the behaviour of fish in the sea. These behaviours change with changing weather conditions. We are also keen on the colour appearance of the corals. They change from dark to shiny with changing weather conditions.* [Male, Bamburi, FGD].

According to the men's FGD at Kanamai, the fishing season must begin with an elaborate ceremony consisting of many rituals. A group of fishers prepare a meal of rice and what they refer to as *samaki mabaki* or "wasted fish". The "wasted fish" are those caught for the first time during the fishing season. They are referred to in that way because they represent the remnants from the previous season. After the meal has been prepared, the fishers take their boats to a central place in the deep sea and anchor them.

This is a specific place called *kitwani* (head). It is the place fishers belonging to a given expedition always go to at the start of every season. The fishers told me that there are many *kitwani* places in the sea. The place is chosen through tradition. However, it is unknown why it was chosen. A number of rituals are performed with prayers and libations are poured into the sea to appease the gods and ancestors. After the praying they burn *ubani* (or incense), a perfume often used in the rites of various religions. It is also at this place and time that the installation of new fishing expedition skippers is undertaken.

To confirm that their prayers have been received well, one of the fishers must experience a seizure. The fisher who gets the seizure is then given *chetezo*, a small water vessel, and a wooden sculpture called *chano,* and dives into the sea to commune with the ancestors and spirits of the sea for half an hour. The vessel contains ashes of burnt incense which is believed to appease ancestors and mollify malevolent spirits in the sea. The sculpture is itself a piece of abstract art. It is a generic representation of ancestors, the reason why it is gender-neutral.

The immersion of the man in a trance makes him the messenger to the origin of the community. He goes to commune with the ancestors to bring back fresh knowledge about the sea and the land for the new season. He is the connection to the origin, differentiation, migration and creative deeds of the ancestors, starting from the very beginning of the world and continuing with the establishment of the traditional order and leading to the roots of the present generations.

The immersion anticipates culture as the creation of nature unfolding in utilitarian categories of classification. It acts as a prelude to classifications of the empirical environment which forms the basis for ecological behaviour. The immersion also reveals the geography of the sea that is at once mythical and real, thus serving as the basis for

behavioural options within this territory. This ritual is a model of reality that combines myth with the empirical nature through culture because it brings forth information about the coming season. The knowledge is defined through the borrowed authority of the ancestors and other benevolent spirits of the sea. This ritual seeks to deflate and deflect the influence of negative forces of nature in the sea.

At the end of the half hour, he resurfaces from the deep sea unscathed. Upon his reemergence, the ceremony begins in earnest with the eating of the food that was carried to the open sea shrine. After the ceremony, the fishers disperse and this marks the beginning of another season of plentiful fishing. The fishers are very categorical that the ritual is about minimising, to the bare least incidence, negative events such as drowning while at sea. They acknowledge that they cannot eliminate them all, since there are some individuals in the community who will still commit crime that will attract the wrath of ancestors and the repercussions of these crimes will affect even innocent people in the community.

4.4 Indigenous knowledge of the physical environment

The Giriama, like many other indigenous groups of people in various parts of the world, perceive and interact with nature in ways they have developed over decades. In the process of interacting with the marine ecosystem, they have developed a system of naming "things" as part of the general communication using words and language. It is an aspect of everyday taxonomy as we distinguish the objects of our experience, together with their similarities and differences, which we identify, name and classify. As a result, the Giriama nomenclature helps to mentally structure the marine world in relation to word meanings and experience.

For these indigenous communities, the environment is where all the resources are found and nurtured. The findings of this study indicate that in the Giriama cosmology, the environment cannot be divided into different parts. The environment, or the world, is a whole whose every component is connected to the other. The marine ecosystem, together with all the resources found therein, is important to the functioning of the whole world. The most frequently used term to describe the environment is the Kiswahili term *mazingira.* This term means surroundings. For Giriama people, the surroundings include

all creations. According to one of the respondents the environment can be conceptualized thus:

> *When you think about the earth, with all the oceans, with their [tides] rising and ebbing, due to the movement of the moon. And about the water in the wells, and about the sun in the sky, all the grass that grows from the water, of the rain that falls from the clouds, and the mangroves in the tepid waters of the sea shore. The coral reef and its inhabitants. Think of the deep sea, and the creeks and the lagoons, all the animals and plants in the sea, those we can see and those we cannot see, the estuaries of the rivers that pour into the blue waters from the inland. Think of the forests and the animals and plants. And the air we breathe. Then the people, who inhabit the land, and use the resources in the sea, and on land. That is the environment. It is these parts that make up the environment. Are there boundaries? I don't know but we can talk about the parts, one by one.* [(Male, 72yrs. IDI Majengo in Kanamai].

The Giriama, like many other indigenous communities classify the environment through cognitive or oral maps. These maps undoubtedly reflect the worldview of how the land and seascapes are organised and utilised. They use lexical categories to identify eco-zones that reflect the local inhabitants' intimate connection with marine nature. Their kinship with the natural environment is often based on a strong spiritual connection with their ancestors and the land where their ancestors are buried as well as on subsistence needs. The oral maps presented by contemporary Giriama people may be seen, in other words, as an indigenous ethnographic model of the cultural code.

The maps reflect social behaviour and aspects of marine resource use and conservation. For the Giriama, these oral maps serve as a framework from which to operationalize local lexical items that may serve as part of the cultural code for aspects of biogeographic categories. Because the very nature of many indigenous societies' lexical items is spatial in nature, it allows for the mapping of terms to form a graphic representation of oral (cultural) maps of various marine ecological zones (including reef locations and fisheries movements) and human activities. This is the basis of marine environmental classification. Those who have the knowledge use it routinely, perhaps every day, and because of this, it becomes something that is a part of them and unidentifiable except in a personal context. These personal cognitive maps are created by humour, humility, tolerance, observation, experience, social interaction, and listening to the conversations and interrogations of the natural and spiritual worlds.

Although it is not easy to get one word in Kigiriama which is equivalent to the word environment, all the respondents demonstrated a vivid perception and conceptual knowledge of the environment. They also demonstrated knowledge of different environmental features and their place in the ecosystem. Moreover, the findings illustrate differentiation among individuals in terms of possessing environmental knowledge. This differentiation is based on experiences dependent on gender, age and occupation of the respondents in regard to their interaction with the marine resources. Furthermore, the ritual, spiritual, religious and physical value of the resources was captured vividly by the respondents. According to one female healer in Bamburi aged 64 years:

> *The environment is the provider of our food and livelihood. It contains the resources we are interested in. But remember some parts of the environment cannot be utilized for anything. These places are used for performing traditional rituals of the community to cleanse the environment. We call them 'palani'. They are mostly used by the community elders and the diseased who attend the rituals. Young people may not be allowed into these areas.*

The environment is important to the Giriama people. According to the accounts of the respondents, it provides the local individuals with building stones (*timbo za mawe*). These stones are dug just like minerals from the ground. The stones are, however, not deep into the ground. Hence the local individuals find an easy task in getting them and putting them into their preferred shapes.

The environment also provides building poles for their houses. Some poles are obtained from the mangroves (*fito)* and others from the trees available in terrestrial forests. In addition, the environment provides food for the people and space for shelter of the people living there. The clean air people and other animals breathe is provided by the environment. According to the respondents, environmental features can be classified into natural and artificial or human-made features. Natural features are those features that grow on their own. They are formed by natural forces or powers. They could also be attributed to supernatural forces or powers. Artificial features, on the other hand, are features which are made or planted by human beings in the environment.

> *The natural environmental features can be divided into land, water and air. For me, land is the area of the environment which is dry. There is no river, lake or no ocean water on it. We call it 'nchi kaavu'. All these components and parts of the environment are useful.* [Male, 49 yrs. Mtwapa, IDI].

Another part of the environment is the sea. This is the area of the environment with ocean water. This is the area in which fish and other marine plants and animals are found. They

call it *ziwa* or *bahari*. In the sea are to be found fisheries, mangroves and corals. The fish, for them, are all the living animal species found in the sea. Mangroves are trees that grow in areas with muddy flats, that is, a mixture of ocean and river water, while coral reefs and corals form the wall between the shallow waters and the deep seawaters. A 68-year-old fisher in Mtwapa had this to say:

> *They are formed by the deposition of the remains of dead fish and other marine animals. We believe that corals are also living because they breathe and they can also die. They are living because they provide the fish species with food and fresh air.*

One of the areas of interest are the terminologies used to refer to environmental features in the local language. To set off the naming of the environment, we may begin with the term environment itself. Among the Giriama, the term environment is related to other categories of naming. The closely related concepts are space, weather, climate and time. The term environment is called *mazingira,* which may also mean surroundings. This term has its etymology in the verb *kuzingira* meaning to surround. Indeed, this is the same term used in Kiswahili, the dominant language in East Africa and the national language of Kenya.

Climate, on the other hand, is referred to as *musimu,* which may interchangeably refer to season. The term is also found in Kiswahili. The term for the weather is *dzoho* while space is referred to as *nafasi* and time is *wakadhi*. It is notable that *dzoho* also refers to temperature, particularly high temperature. Natural resources are referred to as *mali ya mulungu mwenge,* which loosely translates to God's natural (or real) wealth. It is remarkable that the Giriama have a strong sense of belief in the ancestral spirits. In this case, the reference to God is connected to the ancestors, who are considered intermediaries between the living and *mulungu mwenge* (the Supreme Being). This forms the basis of the spiritual connection between the Giriama and their natural resources. According to a 29-year-old male fisher at Kisauni:

> *The ancestors are the custodians of all the resources. Thus, it is only the deference accorded to ancestors that can allow one to have the knowledge about the resources as well as how to utilise them.*

Some individuals know more about fisheries as compared to mangroves and corals, and vice versa. Along these lines then, the Giriama classify the environmental phenomena through various ways. This also applies to the marine environment. One of the ways is the

bio-physical dichotomy. An aspect of the environment is classified as either living or non-living. Nevertheless, even the non-living facets have living qualities. In consequence, the marine environment comprises the sea and all the creatures and physical features found in it.

For the Giriama, seawater is the main aspect of the marine environment. It is the home of the marine resources. In the indigenous cosmology of the Giriama people seawater is both a living and a non-living feature of the marine environment. It is living because it provides life to all the plant and animal species found in it. It is non-living because it does not have life of its own. In the words of Ali Mohammed, aged 56 years from Mtwapa, this interrelationship between the sea and its inhabitants could be summed up thus:

> *Sea water itself is a living thing. It breathes life as it has clean air that it gives to creatures living in it. It also cleans itself after the creatures have deposited their waste products. It is the creatures which make the sea complete. The sea cannot be complete without the creatures and physical features found in the water. Likewise, the sea creatures and physical features would be naked if the sea was to be wiped away, and they would not exist as we know them. The sea is a big living thing.*

Marine resources can also be classified according to the physical position in relation to the sea. The Giriama classify the marine environment into inter-tidal **zones,** the mangrove forests, the coral reef and the open deep sea. The classification of the areas has interesting geo-spatial as well as ritual significance. In looking at the corals, for instance, they can be classified at two levels. At one level, the corals are classified according to the amount of life found in them. In this manner, we have dry (or dead) rocks and the living corals which are still breathing. The first category are found along the shore or inland where there is no water to nurture them to life. They are, therefore, effectively dead. At the same time, corals can be classified according to the size of the rocks, which is also a function of their location. In this case, we can talk of those found in the open sea and those found in the creeks. Those found in the open sea are bigger in size compared to those found in the creeks.

The findings indicate that knowledge about natural resources in general and marine resources, in particular, is a function of both interaction as well as interest in the resources. Some individuals know more about fisheries compared to mangroves while the reverse applies to others. This is cognitive mapping at play. It is an aspect of indigenous

knowledge that includes user conceptualization of the distribution of the resource. Among the Giriama, spatial distribution is converted into concepts which are frequently named, especially if they are important reference points. It was possible to construct cognitive maps of the distribution of resources from parts such as coral mining areas, fishing spots or mangrove cutting areas.

At the same time, particular features of the marine resources could frequently be named due to spiritual or ritual significance. Areas of the sea where the fishing expedition performs rituals to bless the beginning of the fishing season each year is a case in point. Other features are named due to their proximity to a creek, mangroves or particular areas in the sea. Apart from the physical classification of the coral, the sea areas and the mangroves through cognitive maps, another aspect of indigenous knowledge is the naming and recognition of aquatic organisms. Therefore, a component of marine resources management, especially fisheries, is fishing itself. Fishing has rules that must be followed to the letter.

> *One of them is to do with fishing in groups. No one goes into the deep sea alone. There are fishing expeditions, each of which has a leader. There is no formal training for fishers and expedition leaders. We are trained through apprenticeship. This entails learning maps, directions, seasons and environmental conditions. The most important thing is following rules and regulations of sea faring. You see there are fishing families through which fishers are raised. In the past fishing was done and led by elders* (Charo Chai, a 40 year-old male fisher at Kanamai).

What comes out of this web of knowledge is that it is a function of meticulous observations by expert fishers as it is a product of deliberate socialisation process, through apprenticeship. In this process, indigenous knowledge becomes the communal property among the fishers, who have internalised the different fish species and their behaviour. They have also internalised the behaviour of the sea in different seasons and times of the day. It is a tool that enables people to make a living from coastal and marine environments, working in isolation or groups. These people rely on indigenous technology operating from small boats. We may also envisage indigenous marine knowledge as social reality in more encompassing symbolic and conceptual frameworks. These are the frameworks governing social relationships and spiritual connections to land, as well as coastal and offshore marine habitats.

That is why for the fishers of Kanamai and Mtwapa, for instance, finding fishing spots is certainly not just a matter of luck. Expedition leaders must be competent to sail at night guided by the stars in order to locate the best and most productive fishing grounds. At the same time, they should be aware of routes in the vast sea, by use of cognitive maps. These routes run along the direction of coral reefs and the caves found in the sea. The fishers have mastered these routes. This, according to the fishers in Kanamai, is a fishing system in which a fishing ground is discovered and pinpointed in the ocean through a complex method of mentally constructed reference points.

In this system, fishers use no compass but still, by crossing imaginary lines and referring to geographical landmarks such as a large coral reef, they are able to retrieve small fishing grounds made of rocky bottoms many kilometres away from the shore. These routes are discovered by deep knowledge of the geography of the sea and the formation, size and shape of the coral reefs. Sometimes, these fishing routes become "owned" by the leader of the expedition who discovers them. Other fishermen do not know the direction of the routes that lead to “fertile” fishing grounds. This system provides insights into the ways in which this community diminishes competition for scarce resources. The routing system is based on traditional knowledge; it is a sign of authority of skippers over the other fishermen. The more routes and rocky grounds the expedition leader discovers and keeps secret, the more fish he lands and the more respect he gets within his community. According to Mzee Mfuko in Mtwapa:

> *The sea has plenty of marks that nobody sees; it is only the leader of the expedition who knows these routes. They are his secret and power over the rest. When he is tired and wants to retire, he will leave the secrets to his son.*

The knowledge system described above has developed within the society because of a number of reasons. One is that the society, through its culture, has maintained strong economic and symbolic ties with the land and the sea through continuous observation of natural cycles. Another reason for the development of this knowledge is the attachment to continual use and occupation of a specific group territory which allows the community to reproduce itself through ongoing traditions of communal and family land and sea tenure. Furthermore, because subsistence activities continue to play a vital role in fishing, crucial socio-economic relations are structured along family, domestic and communal kinship

lines, and the use of relatively simple technology, with limited impact on the environment.

We may also explain the emergence and development of this knowledge on positions of marginality from political power bases that tend to be concentrated in oral traditions responsible for the production and transmission of knowledge, symbols, myths and rituals associated with marine resources and sometimes with small-scale agriculture as well a certain degree of social/cultural identity based on fishing and other maritime activities.

The Giriama people, like many indigenous communities, have evolved notions of the natural world in ways that suit them and their particular context. This means their perceptions and knowledge are in part shaped by their values, worldview, and environmental ethics. Their cosmology and indigenous belief systems are the very foundations of this epistemological evolution in the broader sense. Thus, in the exploration of indigenous knowledge among the Giriama, the study findings indicate that knowledge of the different aspects of nature in general and marine ecosystem in particular is rich and varied. They perceive the environment as a totalising phenomenon, which cannot be sub-divided the way modern ecologists do. However, they are aware of the contiguous boundaries of certain environmental features.

CHAPTER FIVE

INDIGENOUS TAXONOMY OF MARINE RESOURCES

5.1 Introduction

This chapter presents findings on indigenous nomenclature and taxonomy of marine resources by the Giriama people. The chapter looks at the classification of the resources in regard to species and habitat location. It specifically examines how the Giriama culture classifies mangroves, fisheries and corals.

5.2 Classification of the mangrove species

Traditionally, the Giriama, like other Kenyan coastal communities, depend a lot on the mangrove ecosystem. The community exploits this ecosystem for its livelihoods and income. This brings out a complex linkage between mangrove forests and the community. That may explain why the mangroves hold a very special place in Giriama cosmology. According to the respondents, the community values the trees for the forest and not the forest for the trees. Some in worn out boots while others are barefoot, the mangrove cutters hoof their way through the forest. They spent enough time in these forests to know that it always pays to be prepared. Over the years they have learned everything there is to know about the trees and the forest. They know all the species and their associates. Without the trees, there would be no forest, they point out. The forest exists because the trees have not been cut down en masse. This was exemplified by the explanation given by a 67-year-old male elder at Mtwapa:

> *The forest has the right to exist. This is part of the creation given to our ancestors for the best of their children and the children of their children in the distant future. The mangroves have medicinal and aesthetic value. The bark of the mangroves and their leaves can be used for medicinal purposes. They are used to heal the wounds of the circumcised. The dyes from the bark can also be extracted and used to colour the women for beauty purposes. In modern times mangroves have attracted so many tourists, both domestic and international, to the region*.

The community uses a variety of ways to classify the mangroves. One of them is the location of the trees in relation to the sea-land continuum. In this way, there are types that are found deep in the water, those that are semi-immersed and those found away from the sea. The mangroves are also classified according to the size of their stem and, therefore, their use by the community. They are also classified according to the size and shape of their propagule and leaves. The colour and texture of the leaves are also taxonomical

considerations in the community. Finally, they are classified according to the maximum height to which the trees grow.

Thus, for the Giriama, mangroves are not just the fringing vegetation along the lagoons, estuaries and creeks. They are a source of livelihoods and have a spiritual and cosmological significance. They also provide important nursery, shelter and feeding habitats for a wide array of fish, crustaceans and molluscs, which are utilised as commercial and subsistence fisheries. The community is aware of the species and their location in the ecosystem. Table 5.1 provides the species known to the respondents in the research site.

Table 5.1: Mangrove species

Local name	**Botanical name**
Mlilana	*Sonneratia alba*
Mkoko	*Rhizophora mucronata*
Mkandaa	*Geriops tagal*
Muia/Mkoko wimbi	*Bruguiera gymnorhiza*
Mkomafi dume	*Xylocarpus moluccensis*
Msikundazi/Mkungu	*Heritiera litoralis*
Kikandaa	*Lumnitzera racemosa*
Mchu/Mtu	*Avicennia marina*

Source: Author, 2013

According to the respondents and participants in the focus group discussions, the mangrove ecosystem is important in maintaining the ecological balance between the sea and the land. One male elder from Kisauni, aged 69 years, had this to say about the mangrove ecosystem:

> *The mangroves perform various functions which are very important for the well-being of the whole earth. Apart from providing poles for construction of houses and firewood, the mangroves provide food, shelter and nests for marine animal species, as well as birds. For instance, some fish feed on the flowers and fruits of the mangroves. The mangroves also have breathing roots that provide oxygen for the fish. Furthermore, some fish shelter in the mangroves, thus providing for predators which hunt there with plenty of opportunities for food*.

Traditionally, the Giriama community depends on fisheries and mangrove exploitation for their livelihoods and income. This study findings show that there is a complex linkage between mangrove forests and the community. The mangrove forests provide goods and services which support the welfare of the community. From the findings, there is a clear division of mangrove uses on the basis of age and gender within the community. The children catch small crabs and fish for self-consumption at low tides in the shallow inlets

within the forests. Women go to the mangrove mainly for firewood. Men engage in artisanal fishing, which is dependent on the mangrove, coral reef and seagrass ecosystems. The artisanal fishing is carried out in the coral reef, seagrass and mangrove areas. Men also engage in mangrove cutting for building wood. Many people in the research area produce salt by boiling brackish water in clay bowls over fire. Mangroves are heavily exploited as a fuel source using this technique. On a larger scale, salt is harvested from evaporation ponds, shallow brine-filled pits, usually built in cleared mangrove areas.

The importance of the mangroves is further demonstrated by the presence of three birds, *shake* and *membe,* types of egret, and *nyange nyange,* the kingfisher. These birds nest in the mangrove forests and feed on the fish that nest or hide in the forests. The kingfisher particularly feeds on prawns, locally known as *mashaza,* a local delicacy. The small sizes of the prawns make it difficult for fishers to sight them in the sea water. According to a women's FGD at Matsangoni:

> *To catch the prawns you must follow the path of the nyange nyange and membe. They can see through the water and locate the prawns. We depend on their eyes to see for us.*

There is a symbiotic relationship between the fishers and the birds. I was told that any area of the sea being overflown by many kingfishers and egrets is an indication that many fish, particularly prawns are in the water. The fishers then move in very fast to catch the fish. This is the root of the friendship between humans and the two bird species referred to above. They are appropriately called "friends of the fishers" (Bakari, Majengo Kanamai). It is noted that the Giriama use the same term, *mashaza*, to refer to prawns as well as oysters.

The mangroves are home to many aquatic animals. According to the respondents, *kaa*, a generic name for all crabs, are the most conspicuous invertebrates inhabiting mangroves. There are also fish, which feed on plants and other animals in the mangroves. Apart from the aquatic animals, there are bird species such as the great white heron (*membe),* which feed on the aquatic animals. This was summarised by one 55-year-old male respondent from Shanzu as follows:

> *The upper zones are inhabited by those crabs that do well in marshy areas. Then closer to the shore we have others. On top of the roots we have prawns and shrimp. Some of the crabs feed on small organisms and this helps in fertlising*

the ecosystem. Other crabs feed on some snails. We harvest smaller crabs for food. There are also oysters, which secure themselves to lower stems of the mangroves and suck plankton and other food from surrounding waters.

Another function of the mangroves is to provide protection for the dry land from the invasion of the sea water during high tide. According to the women's FGD in Matsangoni:

The waves from sea water are very strong and wash everything standing in their way during the high tide. The mangroves act as a blockade for the water. In this way, erosion is prevented by their presence. Our fathers knew about the important nature of these forests. They, therefore, did not uproot or deplete them.

For the Giriama people, the mangroves have many uses and these are not just about the trees. There are other resources found in the mangroves and the waters surrounding them. These resources are extracted according to age and gender. This utilisation is also an indication of who is most likely to have more knowledge on which resource found in the mangroves. This information is summarised in Table 5.2:

Table 5.2: Use of the mangrove ecosystem

Type of activity	**Gender of users**	**Use**
Cutting of trees for poles	Men	Poles for house and boat construction
Collection of medicinal extracts	Trained men and women	Healing and performance of rituals
Collection of vegetables	Women and girls	Domestic consumption
Collection of firewood	Women and children of both sexes	Sale and domestic use
Harvesting of crustaceans and molluscs	Women	For domestic use and sale

Source: Author, 2013

From Table 5.2, we can deduce that men are likely to know more about the tree species that are used as poles for construction of houses, fences and boats. On their part, women are likely to know more about the species which are used as fuel wood and the *mirindi* (seaweed) plants as well as prawns and other sea creatures which they collect. We can also infer that both men and women who are indigenous medical practitioners are likely to know more about medicinal plants and their extracts in the mangrove ecosystem.

The Giriama have a system of classifying and naming the mangrove ecosystem. There are species and sub-species in the ecosystem. For the Giriama, the mangroves not only refer to the trees found in the intertidal zones but also the animals. Discussions with the elderly

respondents revealed that the mangroves actually divide themselves in zones and stages from inland into the sea. According one male respondent aged 57 years at Matsangoni:

> *One can observe the stages of division of the mangroves from a distance as they grow. It is as if they divide themselves according to the conditions. There are three zones in any mangrove forest. In the first zone, which is nearer the shore, the trees are hard, narrow, have narrow whitish leaves and are strong. Here the trees regenerate through dropping their seeds in sandy soils. In the second zone, the middle one, the trees are bigger and softer with whitish leaves. Here, the trees regenerate through vegetative propagation. This means twigs fall into the muddy soils, anchor themselves and germinate immediately. In the last zone, deeper into the sea water, the trees are softest with green, broad leaves. Here, the trees regenerate through seed propagation.*

Generally the mangroves are referred to as *mikoko,* the plural of *mkoko.* The term *mkoko* itself has the connotation of strength, fortitude and sturdiness in the community's metaphors. It is, however, important to note that *mkoko* in real sense refers to the commonest and most widespread of the species, *Rhyzophora mucronata* (Plate 5.1). This is the hardest of the species. As described by the respondents, the *Rhyzophora mucronata* trees are of average size and have stilt arch roots and prop roots that function to strengthen the tree stand. According to one of the elderly male mangrove cutters aged 68 years:

> *They look like they are standing on their toes. The bark has a crack-like surface around the trunk and almost black in colour. The leaves are green and shaped like sharp-pointed ears and wide and also have brown spots on the underside surface of the leaves. The tip and base of the leaves are broad and thorny on the underside. They have bigger flowers than the other species and the flower stems are white with thick petals. The wood from this tree is mainly used for building wood and high quality charcoal. It may also be used for firewood, dyes, medicines, ointments, bow-nets (using roots), fishing traps and weapons.*

Plate 5.1: Mkoko (Rhizophora mucronata) leaves and fruits. *Source: Author, 2013.*

The mangrove cutter who gave the information above also described another species of mangroves, locally known as *mlilana* (*Sonneratia alba*) (Plate 5.2). According to him, it grows to about 15m tall. He described its characteristics thus:

> *The bark looks almost white although shaded brown. At times it also looks like ash. It has normal roots like other trees and the leaves are rounded and leathery. The flowers are white and pom-pom-like and open only for one night. Their fruits are large, green, leathery berries with a star-shaped base and have many seeds, which are white and flat. Its wood is mainly used to make canoes, boat ribs, paddles, masts, Smith pneumatophores used for floating fishing gears, as well as window and door frames. It may also be used for firewood and charcoal.*

Plate 5.2: Mlilana (Sonneratia alba) tree (left) and its leaves and fruits (right). *Source: Author, 2013.*

The *mkandaa (Ceriops tagal*) [Plate 5.3] is a tree that has many shapes and sizes, according to the respondents. It is also called *mkandaa mwekundu* (the red *mkandaa) or mkoko mwekundu* (the red *mkoko).* According to the men's FGD in Kanamai, it is the tallest among the mangroves. According to the men's FGD in Mtwapa its features are:

> *It has a slender stem and a compact crown in a favourable site. If its seeds drop in poorer conditions it will not grow tall and will develop into a small bush. The roots are like those of the mkoko, looking as if they are standing on toes. It is used as building material, paddles, oars, firewood, charcoal, dyes and fishing traps.*

Plate 5.3: Mkandaa (Ceriops tagal) tree (left) and leaves (right). *Source: Author, 2013*.

The respondents also described another interesting type of mangroves locally called *muia/mkoko wimbi (Bruguiera gymnorhiza)* as the seeds germinate while still attached to the tree. According to one male cutter in Kanamai, aged 34 years:

> *Its alternative name, wimbi, means wave. Its growth is characterised by a wave-like development. After the seedlings are released they fall vertically into the mud and become established rapidly. The tree likes very salty areas in which conditions it can grow up to 20 metres. Absence of salty conditions stunts its growth. Its wood is used mainly for building material, roof supports and firewood. It is also used for producing high quality charcoal, boat paddles, oars, handcraft handles, axe handles, pounding poles, beehives and traditional drums; the roots provide remedies.*

Another interesting species is *mkomafi dume* (*Xylocarpus moluccensis)* which literally translated means the male type of the tree. However, it is rare in the area where the study was conducted. The leaves of the tree are less leathery and lighter green than those of other species and the end of the leaf is pointed. The tree has underground roots just like other terrestrial trees. According to the respondent above:

> *The tree derives its local name from the type of roots, which differ from other mangroves. It stands firm like a man. Its wood is mainly used for high quality timber that is good for bed construction, window and door frames. It may also be used for charcoal and firewood.*

The same respondent described the looking-glass *msikundazi,* also known as *mkungu (Heritiera littoralis)* as a large tree. According to him:

> *It has nuts that look like wings. One also knows it easily by the silvery scales on the underside of its leaves. The leaves appear green from top and white from below, its name means the lid of a cooking pot. That is how the pods look.*

Another species is *kikandaa (Lumnitzera racemosa)* which, according to one male respondent in Shanzu aged 47 years, the local people refer to as the black mangrove or the small *mkandaa.* He described the species thus:

> *There are two types which look the same as a plant but with differing flower colour. Each grows in its own environment. When their environments overlap, you will find that the trees in the intermediate environment have features of both types. One of them has red flowers whereas the other has white flowers.*

Then we have *mchu* (*Avicennia marina*), which is sometimes referred to as *mtu* (person). It is also called *mtswi* (or white mangrove). According to a male respondent in Kanamai aged 42 years, the white mangrove, as it is commonly referred to, is considered sacred among the Giriama people. He described its features thus:

The bark is pale yellowish green, with raised dots. It has many underground root systems with 'pencil roots' which stick up out of the mud in dense strands spreading out from the tree. Its leaves are thick, leathery, shiny olive green above, with dense grey hairs beneath. The flowers look like milk though closer to yellow and smell like the perfumes women spray on themselves. The fruit looks like a green egg and its seeds develop on the tree, the fruit usually splitting after falling. It is used for producing high quality charcoal, boat paddles, oars, and handicraft handles, axe handles, pounding poles, beehives and traditional drums while the roots provide medicinal remedies.

5.3 Classification of corals and coral reefs

Corals and coral reefs are underwater structures made from calcium carbonate secreted by corals. Coral reefs are colonies of tiny animals found in marine waters that contain few nutrients. Most coral reefs are built from stony corals, which in turn consist of polyps that cluster in groups. The polyps belong to a group of animals that includes sea anemones and jellyfish. Unlike sea anemones, coral polyps secrete hard carbonate exoskeletons which support and protect their bodies. Corals are known locally in Swahili as *matumbawe* and coral reefs are known as *miamba ya baharini* (rocks of the ocean).

Coral reefs provide habitats for marine fish species, build tropical islands, protect coasts from waves and storms, and contain an array of potential pharmaceuticals, and support tourism and fishing industries worth billions of dollars. According to the respondents, these are the houses and resting places for some fisher species. Additionally, they provide fresh air and oxygen for the fish which they take through their breathing organs, gills (locally called *mathefu*).

The distribution of corals is affected by the force of waves. Where the waves are strong there will be more corals and, therefore, a number of species that feed on the corals as well as depend on the corals for the supply of oxygen. Small corals are found in the creeks. These corals are believed to belong to ancestors. This is where cleansing and initiation rites are performed. It is considered repugnant to collect these corals. Coral reefs are also fundamental to the social fabric of local communities, providing a source of food, materials and traditional activities. According to one male fisher at Kanamai aged 43 years:

Coral reefs are living organisms that grow best in warm, shallow and clear waters. We call them "the thick forest of the sea". Some animals like the octopus (pweza) are found among corals.

According to one of the key informants from KMFRI:

> *The distribution of corals depends on a number of factors. The amount of water in an area is one of the factors. Some corals are found deep in the sea while others are just adjacent to the mangroves.*

Corals have diverse uses. According to members of the women's FGD in Matsangoni:

> *Dead corals are used for scratching the feet to remove dead skin. In this way they are used to make the feet shinny. They also added that there are special corals used when playing Ajua, a type of board game. They are given to the winner as a gift during the game. Corals are also used for decoration in houses to make them appealing. For some animals in the sea, they act as security areas. They provide hiding places for some species looking for their safety against predators. Some fish species get food in the corals too. Apart from providing conditions for hiding and food, corals also act as breeding areas for some of the fish species.*

According to some of the respondents corals are the houses of fishes. That means that if they are removed, the habitat for the fishes is destroyed.

5.4 Classification of fisheries

The Giriama classify all the animal species found in the sea as fisheries. For them, any animal species found in the sea is part of fisheries. The number of aquatic organisms distinguished and named by the Giriama fishers is enormous, reflecting both the extent of indigenous knowledge they possess and the species diversity characteristic of the coral reef areas, mangrove forests and the deep sea. In classifying the fisheries, there are those species found among corals, then those found in mangroves and those found in the open deep sea. According to the respondents, the location of the species is a function of adaptation to the conditions as well as their survival needs.

The respondents were able to construct food webs and energy levels based on their interaction with resources over a long time. At the lowest point are those species that feed on planktons and mangrove droppings. Such species as *mkizi* (cuttlefish) and *tafi* (Plate 5.6) are in this category. They are followed by *changu* that feeds on the species such as small crabs and worms. Then we have *tewa* that approaches the higher echelons of the food chain because it feeds on other fish species. At the top of the chain are *nyagumi* (the whale and *papa* (the shark) and *Pomboo domo-refu* (the dolphin) which respondents indicated, do not lay eggs but give birth to their young. The dolphin is the most intelligent and it feeds on sea grass and weeds. It does not feed on other sea animal species. Another species is the barracuda, locally called *tangesi*. This species feeds on

other sea species. Finally, is *ngisi* (squid) which feeds on other fish species. An example of a food web, with trophic levels as presented by the fishers is illustrated in Figure 5.1.

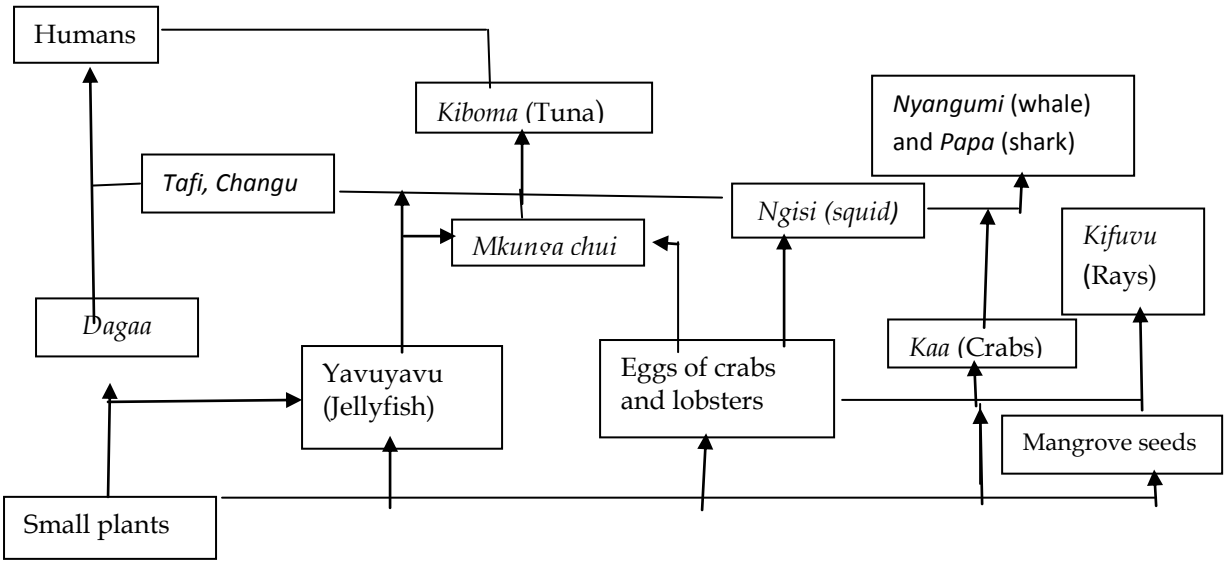

Figure 5.1: An indigenous food web and trophic levels for fisheries

From the interviews and discussions it emerged that those fisheries found in the corals are those which feed on planktons that make up the corals. These species also find the conditions in the rocks conducive for their survival against predators in the deep sea. They also spawn in the corals and hatch their eggs in these conditions. According to one of the informants, "such species feed on the muddy conditions". To get this classification for fisheries, we asked the respondents to freely list all the fish species they know (See Tables 5.3 – 5.6).

Apart from the food webs, the respondents were able to describe some life history stages of some fish (egg, larvae, young and adult). According to them these life history stages are often in distinctly different environments. Therefore, they require distinct resources and different ecological processes. There is also seasonality in spawning for the fishes, especially coral reef fish. They described how some of the coral reef associated species undertake seasonal migrations to aggregate in offshore areas where they undergo broadcast usually in the outer reef crest and channels leading through the reef. Their eggs and larvae then drift back into shallower waters to settle within sea grass beds and mangrove creek habitats. According to Mzee Mfuko:

> *Reproduction migrations are adaptive strategies for efficient utilisation of the habitats because this ensures that the larvae are spawned in areas where the currents favour their return to shallow nursery grounds that will facilitate their growth to become parents themselves. Changu, tafi manga, tafi mtunga and mchakufa reproduce in this way.*

According to the respondents and key informants, some species including fish and mud crabs, have adopted a life strategy whereby they migrate from the coral reefs to seagrass beds and mangroves as they mature. Therefore, the shift in habitats from the adjacent coral reefs establishes a connection between mangroves, coral reefs and the deep sea. This gives an indication of tracing fish migration patterns. From the accounts of the respondents *changu* exhibits such significant changes in migration patterns based on the food resources and temperatures in the sea. According to the respondents, the shift in habitats from the adjacent coral reefs establishes a strong connectivity and food exchange between the three ecosystems in the ontogenic development of the fish species.

In classifying the fisheries, the Giriama people indicate and distinguish the species which are only found in the deep sea, those only found in muddy shallows of the mangroves (called *tope tope*) and those found in corals along the shores. For example, big fish like sharks (*papa*) and whales (*nyangumi*) are only found in the deep sea. These cannot be found along the muddy pads of the mangroves as they are suited to hunting in the deep sea. One main reason why they are found in the sea is the kind of food they eat. Both species are carnivorous, meaning they feed on other fish species. They can only be found along the shores when they have spotted food. Among the Giriama, the fishers recognise and name 19 species of fisheries found in mangroves, lagoons and shallow inshore waters. However, some species such as *sonyo* (sunrise goatfish) can also be found in corals and reefs.

Interviews with the respondents indicate that a large number of fish species utilise mangrove areas as larvae, juveniles or adults. The fish fauna, however, overlap considerably between coral reefs, sea grass beds and mangroves. This overlap indicates strong linkages between the three ecosystems. The key informants also reported that the greatest diversity of fisheries is found in the corals and coral reefs. The list of species found in mangroves and lagoons by use is presented in Table 5.3.

Table 5.3: Free listing of fisheries by use found in mangroves and lagoons

N	Local name	Scientific name	Common name	Uses
1.	*Gona*	*Rhinecanthus aculeatus*	Blackbar triggerfish	Food fish
		R. assasia	Picasso triggerfish	Food fish
2.	*Kambe*	*Siganus*	Juvenile rabbitfish	Food fish
3.	*Kangaja*	*Acanthurus nigficans*	Brown surgeon fish	Food fish
		A. nigrofuscus	Black surgeon fish	Fish food fish
4.	*Kasa kikoshi*	*Lepidochelys olivacea*	Olive ridley turtle	Non-food
5.	*Kasa mwamba*	*Eretmochelys imbricata*	Hawksbill turtle	Shell sold (not eaten at home)
6.	*Kasa uziwa*	*Chelonia mydas*	Green sea turtle	Food/medicinal
7.	*Kikande*	Balistapus undulatus	Orange-striped trigger	Food fish (not sold)
8.	*Kufi*	*Kyphosus cinetascens*	Blue chub	Food fish
9.	*Matiti*	*Holthuridae*	Diamond mullet	Food fish
10.	*Makarenge*	*Pempheris ovalensis*	Sweeper	Food fish
11	*Mtonzi*	*Plotosus nkunga*	Eel catfish	Food fish
12	*Papa upanga*	*Pristis microdon*	Small tooth sawfish	Food
		P. pectinata	Sawfish	Food
13	*Simba*	*Lambis lambis*	Scorpion shell	Sold (not eaten at home)
14	*Simsim*	*Sprattus sprattus*	Sprat	Food
15	*Sonyo*	*Upeneus sulphureus*	Sunrise goatfish	Food fish
16	*Tafi*		Mudfish	Food

Source: Author, 2013

From the list in Table 5.3, we notice that the Giriama taxonomy of fisheries that habitually live in mangroves identifies 16 species, while that of modern science identifies 19 species. For the Giriama, *Rhinecanthus aculeatus (*blackbar triggerfish) and *R. assasia* (Picasso triggerfish) are simply named *gona.* They are one and the same species. There is no reason to separate them. The same applies to *Acanthurus nigficans* (brown surgeon fish and *A. nigrofuscus* (black surgeon fish). In the scientific taxonomy, the two are only differentiated by the colour when it comes to the common English name. The colour difference does not register among the Giriama taxonomists. In the case of sharks, the Giriama agree with the scientific taxonomy in differentiating the normal shark from the reef shark. The same applies to the small tooth sawfish and the sawfish. The local name of species suggests the ability to cut through something, since the word *upanga* is the equivalent of a machete. The difference in the size of the teeth does not amount to a need to separate the two types of fish.

The mangroves and lagoons provide ideal spawning and food conditions for these species. The Giriama fishers have observed the species over long periods of time and describe their habits. One of the respondents described the behaviour of the *gona* (blackbar triggerfish) thus:

> *This fish enjoys the shallower waters inside and outside the mangroves although it also enjoys the reef where lots of rocks and holes are present. These help it to hide in and search for food and hide from predators.*

The respondents identified and described 23 species of fisheries found in the deep sea. This contrasts with 25 corresponding species identified by scientific taxonomists. Table 5.4 presents these types of fish. According to them, these types of fish have special feeding mechanisms because food is scarce in these zones. However, some of them such as *simu* survive both in the deep sea and the reef areas. According to Mzee Mfuko:

> *These types of fish feed on decaying or rotten remains of plants or other fish which come from the other parts of the ocean. Some of them, such as kingfish, are accomplished swimmers and hunters. They can cover very large areas of the ocean very fast and catch their food and retreat into the depths. Some of them also depend on such hunters as the shark or whale to kill for them to survive. Sometimes the corpses of whales and shark sink to the bottom of the sea and these provide food for some animals such as crabs and worms.*

Table 5.4: Fisheries found in the deep sea

No	Local name	Scientific name	Common name	Uses
1.	*Bunju miiba*	*Diodon hystrax*	Porcupine fish	Non-food, dangerous
2.	*Chuchungi*	*Hemiramphus far*	Halfbeak	Bait/food fish
3.	*Dagaa*	*Engraulidae*	Anchovy	Food fish
4.	*Jogoo nyeupe*	*Stichopus vatiegatus*	Sea cucumber	Not food (sold to restaurants)
5	*Kaa*	*Various*	Crab	High value food
6	*Kambare*	*Various*	Catfish	Food fish
7	*Kiazi*	*Holothuridae*	Sea cucumber	Sold
8	*Kiboma*	*Thunnus albacares*	Tuna	High value food
9	*Kifuvu*	*Holocentrus sumara*	Soldier fish/ray finned fish	Food fish (if large)
10	*Madorado/fulusi*	*C. hippurus*	Dolphin fish	Food
11	*Mkundaji*	*Parupenus indicus*	Indian goat fish	Food fish
12	*Ngisi*	*Sepia spp.*	Squid	Food, handline bait
13	*Nguru*	*S. commerson*	Kingfish	Food fish (now rarely caught)
14	*Nguva*	Sirenia	Dugong/mermaid	Food of the past (capture illegal)
14	*Nyangumi*	*Odontoceti spp*	Whale	Meat food
16.	*Panga*	*Trichiurus lepturus*	Ribbonfish	Food fish
		Chirocentrus	Wolf herring	Food fish
17	*Papa*	*C. archarhinus*	Shark	Food fish, fins exported
18	*Papa karaji*	*C. melanopterus*	Blacktip reef shark	Food
19	*Pound*	*(not available)*	Sea cucumber	Sold to Chinese
20	*Pweza*	*Octopus vulgaris*	Octopus/devil fish	Food fish
21	*Simu*	*Sardinella melaneura*	Sardine	Food fish, bait

22	*Suli suli*	*Maikaim indica*	Black marlin	Food fish
		M nigricans	Blue marlin	Food fish
23	*Tembo*	*L.Stigma*	One-spot snapper	Food fish

Source: Author, 2013

The respondents also identified and described 17 fish species that are found in sandy, muddy and rocky bottoms (Table 5.5). According to the key informants from KMFRI, NEMA and KWS, these are fishes that inhabit sandy and weedy areas near coral reefs and mangrove mud flats. They are camouflaged and usually swim in the cover of the substrate and feed on shrimps, small fishes, and crabs. These fishes also enjoy the shallower waters inside and outside the reef where lots of rocks and creviced structures are present to hide in and search for food from. They prefer to establish an adequate sized territory of their own. One of male respondents in Kanamai aged 47 years observed thus:

> *These types of fish hunt by ambushing their prey. They will wait and watch their prey and wait for a sudden burst of movement before striking.*

Table 5.5: Fisheries found in sandy and muddy bottoms

No	Local Name	Scientific name	Common Name	Uses
1	*Chale*	*Pterois volitans*	Fire fish	Non-food poisonous
2	*Changu*	*Lethrinus variegatus*	Variegated emperor	Food fish
3	*Ebrahim*	*Gymnothorax flavimarginatus*	Yellow margin moray	Sometimes used as food
4	*Fulusi*	*Coryphaena hippurus*	Dolphin fish	Fixed long line bait
5	*Gufadi*	Otolithus ruber	Snapper kob	Food fish
6	*Kamba*	*Various*	Prawn/lobster)	High value food
7	*Kiteza*	*Trtpedo fuscomaculata*	Electric ray	Non-food/ dangerous
8	*Kungugu*	*Cypmea tigris*	Tiger cowrie	Shell sold
9	*Kwangu*	*T. lunare*	Moon wrasse	Food fish
10	*Kwangu*	*T. klunzingeri*	Klunzinger's wrasse)	Food fish
11	*Mgunda*	Bursa *lampus*	Lamp shell	Food, shell sold
12	*Mwenza mawe*	*Coris formosa*	Queen coris	Food
13	*Ndondo (dondo)*	*Cypraecassis ruja*	Helmet shell	Shell sold
14	*Nyale*	*Strombus*	Conch	Meat/ shell sold
15	*Pamamba*	*Plectorhynchus gaterinus*	Black-spotted grunter	Food fish
16	*Pamamba*	*Pomadasys permmersonii*	Spotted grunter	Food fish
17	*Shana*	*Drepane longimanus*	Sicklefish	Food fish
18	*Tewa chui*	*Epinephelus merra*	Honeycomb rod cod	Food fish
19	*Yavuyavu*		Jellyfish	Non-food item

Source: Author, 2013

The respondents identified and described 44 species that thrive in corals and coral reefs, meaning that most of the fish species are to be found in these ecosystems. This contrasts with the corresponding 55 identified through scientific taxonomy (Table 5.6). According to them, there is plenty of food in the corals and reefs. Moreover, those fish which reside

in corals and reefs are easy prey since they cannot swim with speed. Therefore, as Charo Chai of Kanamai put it:

> *Many fish that live in the reefs and corals have complicated colours to confuse predators. And since most of these fish are small, they get protection from predators by hiding in reef holes. Many reef fish stay in one place where every hiding place is known and they can get to it fast. Others swim around the reefs for food in groups, but return to a known area to hide when they are inactive. When they are resting they are still very vulnerable to attack by crevice predators, so many fish, such as sonyo (sunrise goatfish) and sonyo (yellow-striped goatfish) squeeze into a small hiding place and wedge themselves by erecting their spines.*

This information was corroborated by one of the key informants from NEMA. According to him:

> *Coral reefs form complex ecosystems with a lot of biodiversity. The fish in these ecosystems stand out as particularly colourful and interesting to watch. Because of the rich nature of the nutrients, hundreds of species can exist in a small area of a healthy reef. You will find many of them hidden or well camouflaged. Thus, reef fish have developed many ingenious specialisations adapted to survival in the reefs.*

Table 5.6: Fisheries found in corals and coral reefs

N	Local name	Scientific name	Common name	Uses
1.	*Bocho*	*Synanceia venucosa*	Stone fish	Poisonous, non-food
2.	*Bua*	*Cheilio inermis*	Cigar wrasse	Food fish
3	*Chaa*	*Gerres oyena*	Purse mouth	Food fish
4	*Fute*	*Plectorhinchus picus*	Dotted Sweetlips,	Food fish
		P. schhotaf	Minstrel	Food fish
5	*Kambisi*	*Caranx melampygus*	Bluefin kingfish	Food fish
		C. sem	Blacktip kingfish	Food fish
6	*Kibora*	*Canthigaster valentini*	Model toby	Toxic, non-food fish
7	*Kikorokoro*	Chaetodon auriga	Threadfin butterfly	Food fish (if large)
8	*Kingoye*	Acanthurus lineatus	Blue-banded surgeon	Food fish
9	*Kipungu*	Aetobatus narinari	Spotted ray fish	Food
10	*Kitatange*	C. vagabundus)	Crisscross butterfly fish	Food fish (if large)
11	*Kolekole*	*Caranx (vatious types*	King fish	Food fish
		Carangoidesferdan	Blue king fish	Food fish
		C fulvoguttatus	Yellow spotted king	Fish food fish
12	*Kolekole/m wewe*	*Macolor niger*	White and black snapper	Food fish
13	*Kotwe*	*Carangoides armatus*	Longfin kingfish	Food fish
		C. chtysophtys	Longnose kingfish	Food fish
14	*Kufi*	*Kyphosus vaigiensis*	Brassy chub	Food fish
15	*Kuninga*	*Elagatis bipinnulatus*	Rainbow runner	Food fish
16	*Kwangu*	*Thalassoma purpureum*	Surge wrasse	food fish
		Scarus (several)	Parrot fish	Food fish
17	*Lulu*	Carapus acus	Pearl	Not food sold (in past)
18	*Matotovu*	*Acanthaster planci*	Star fish	
19	*Mchakufa*	*Lethrinus harak*	Black spot emperor	Food fish
20	*mkizi*	*Mugil.seheli*	Mullet/cuttlefish	Food fish
21	*Mkundaji*	*Parupeneus barberinus*	Dash-dot goat fish	Food fish
22	*Mkunga chui*	*Gymnothoraxfavanicus*	Giant moray eel	Generally non-food
23	*Mkunga*	*Conge1 cinereus*	Conger eel	Food
24	*Mleya/*	*Plectorhinchus*	Black-spotted rubberlip	Food fish

	nyeya	*gate1inus*		
25	*Msabuni*	*Gmmmistes sexlineatus*	Soap fish	Non-food fish
26	*Mtumbuu*	*Strongylura leiura*	Yellow needlefish	Food fish
27	*Mwenza mawe*	*Cofis formosa*	Queen coris	Food fish
28	*Mweru*	*Caesio st1iatus*	Striated caesio	Food
		Caesio chrysozona	Goldband caesio)	Food fish
29	*Mwiva*	*Fistuleria petimba*	Flutemouth	Food fish
30	*Nauna*	Tetraodontidae	Puffer fish	Not food poisonous
31	*Ngangu*	*Terpon jarbua*	Thorn fish	Food fish
32	*Ng'ombe maji*	*Ostracion meleagris*	White-spotted boxfish	Food fish (if large)
33	*Numba*	*Luijanus*	Humpback snapper	Food fish
		Lutjanus campechanus	Red snapper	Food
34	*Oona (una)*	*Rastrelliger kanagu1ta*	Indian mackerel	Non-Food fish
35	*Pono*	*Leptoscarus vaigienis*	Marbled parrotfish	Food fish
36	*Pono kasiki*	*Calotomus carolinus*	Christmas parrotfish	Food fish
37	*Puju*	*Naso brachycentron*	Humpback Unicom	Food fish
38	*Simu*	*Sardinella melaneura*	Sardine	Food fish, bait
39	*Sonyo*	*Upeneus sulphureus*	Sunrise goatfish	Food fish
		Mulloides flavolineatus	Yellow stripe goatfish	Food fish
40	*Taa*	Torpedinidae	Ray	Food
41	*Tafi manga*	*Siganus stellatus*	Spotted rabbit fish	Food fish
42	*Tafi mtunga*	*Siganus argenteus*	Fork tail rabbit fish	Food fish
43	*Tangesi*	*Syhyraena barracuda*	Barracuda	Food fish
44	*Tewa*	*Sebastes spp*	Rock fish	Food

Source: Author, 2013

Apart from the location of habitat, the Giriama also distinguish those species which are edible and those which are not. Some species are only used for purposes of bait. This points to indigenous knowledge of the feeding habits of the various fish species. In some cases, fish species are classified as non-food, but sold to restaurants. This, again provides insights into Giriama beliefs about the economic value of certain species which, in their culture, are not edible.

The distinction between those species, which are food items and those which are not also reveals an interesting narrative about values and norms in regard to the treatment given to fish species. On the one hand, there is direct biological and natural relationship between some species selected as food and non-food items based on poison found in their bodies. Biological compatibility and physical availability are at play in this case. The idea is that humans select from the environment as food only those items which are not only readily available but are also biologically digestible and are beneficial to the body in regard to nutrients.

On the other hand, there are interesting cultural symbolisms connecting those classified as food items, whether or not they can be sold on the open market. Then we have those species identified as non-food, though they are non-poisonous. This classification brings out the symbolic and ritualistic explanations of purity. Species such as *gona* (triggerfish) and *kikande* (orange-striped trigger –Plate 5.1) are classified as food items and are only consumed in the household. They cannot be sold. According to one male respondent in Shanzu aged 65 years, "*Selling these species is like auctioning your gift of fishing and knowledge".*

Plate 5.4: Kikande (left) and gona (right). *Source: Author, 2013.*

According to the respondents, the most common fish caught are *tafi* (Plate 5.3), *changu*, and *pono.* These three types of fish are caught using accepted, traditional fishing gear and methods such as basket traps but *tafi* and *changu* are also caught using gill nets, while *changu* and a few *tafi* are caught using hand lines. Other marine organisms such as a variety of *jogoo,* including *kiazi*, *pound, matiti* and *kaa,* are caught with sticks or gleaned (picked by hand). Additionally, fairly commonly caught fish and marine organisms using *chaa, gona, kangaja, kwangu, mchakufa, mkundaji, puju, tembo, tewa, togoo,* and a variety of eels *(ebrahim* and *mkunga*).

The fishers reported that *dagaa* and *simu* are migrating, shoaling fish caught only a few days per year in large volumes. To locate them in the water, fishers rely on three birds, *nyange nyange, membe* and *shake.* These birds are referred to as the fishers' friends. They have a very strong vision which can see deep into the sea. Upon locating the small *dagaa* and *simu*, they dive headlong into the water and scoop the fish. The fishers then follow

suit and place their traps and nets in the water from where the birds have scooped the small fish. On their part, octopuses (*pweza*) are caught with sticks, but increasingly also with spear guns.

Then there are poisonous species such as *chale* and *bochwe* (*nyenga),* with *bochwe* being the most poisonous. According to one male respondent in Shanzu:

> *It hides in rocky areas and sticks its thorny spike out for someone to step on and be stung. It also uses the spike to immobilize its prey.*

Other poisonous fish include *totovu* (stone fish), *kibora* (model toby) and *mkunga chui* (giant moray eel). These are so poisonous that even after cooking they are still not edible. There are others which induce allergic conditions such as *tafi.* These ones are prepared properly before eating. Then we have species with bad omen and ill luck such as *kwiri*. It is believed that if this fish is caught, there will be no buyers for the catch of that day.

At the same time, there are species which are considered non-food items purely on symbolic and ritual basis. Examples include jogoo *nyeupe* (sea cucumber), *kasa mwamba* (hawksbill turtle shell – Plate 5.5), *kasa kikoshi* (olive ridley turtle), *lulu* (pearl) and *simba* (scorpion shell – Plate 5.5). The reason given is simply that these species have never been considered food by the Giriama people. According to key informants from NEMA and KWS, some inedible species such as *kasa mwamba* are endangered and, therefore, their capture is illegal.

Some of the fisheries are valued for their medicinal properties. According to Chai Bakari, *kasa uziwa* (green sea turtle) is highly medicinal. Its capture is restricted by the community as it is labelled sacred. However, their capture is also illegal because it is one of the species on the endangered list. Also, there are some species which are edible but have become rare. According to Mzee Mfuko from Mtwapa, *papa upanga* (sawfish), *kambisi* (bluefin kingfish), *kambisi* (blacktip kingfish), *kotwe* (longfin kingfish), *kotwe* (longnose kingfish), *mweru* (striated caesio), and *mweru* (goldband caesio), have become rare in their fishing grounds. The fishers also list fish species that are caught for food but only if they are large. According to Mzee Mfuko:

> *It is taboo to eat young or small kikorokoro (threadfin butterfly), kitatange (crisscross butterfly fish) and ng'ombe maji (white-spotted boxfish). These are only caught for food when they are mature.*

Plate 5.5: Scorpion shell (left) and hawksbill turtle shell (left) *Source: Author, 2013.*

Among Giriama fishers, as Tables 5.3 – 5.6 indicate, fish have a great importance in indigenous classification, being the most meticulously classified in categories built upon multiple criteria. There is a certain deference to fish which is sometimes made clear by the use of the onomatopoeic terms that name and classify according to behaviour or physical features. *Mchakufa* and *msabuni* easily come to mind. The former is named in reference to its observed behaviour, meaning "the one who worships death or fears dying". The latter is named after its physical characteristics, meaning "soap fish". Interestingly, this is the common English name given to the species. *Msabuni* looks like soap, hence the name, while *mchakufa* does not die easily even after removal from the sea, staying for a long time.

There are other linguistic metaphors which imply the deference for fish. *Kiboma* and *mwenza mawe* fall under this category. These are kinship terms in Giriama language referring to marriage relations, preference or love. *Kiboma* refers to the second or last wife in a polygynous setting. This species derives its name from common parlance in reference to indirect behaviour indicating beauty and possible sexual interest and gender relations. It also indicates public display of sexuality pervasive in Giriama life through gendered speech and flirtatious terminology. The term also implies exchange of power in kinship context.

Therefore, *kiboma* is the woman whom the husband, who has more than one wife, dedicates most of the attention too, at least in normal or ideal situations. And that may

obtain in literal terms of a naming system. There are situations when the last wife is not necessarily the one on which the husband showers attention. The "preferred wife" then becomes the most appropriate symbolic translation of the term *kiboma.* This in fact then means the wife who the husband will have every bit of, that is, the woman the man spends most of the time with and whose affections he does not tire to taste and savour. The species is a delicacy and the name comes from its preference over other fish species in the ocean.

Then, we have *mwenza mawe* which refers to the one who cohabits with stones. The latter's local name is derived from its habitat; it thrives in the rocky areas of the ocean. This name is also connected with kinship, especially consanguinity. This community is polygynous and the term *mke mwenza* means co-wife. And since the fish literally lives among stones, it is referred to as the "one who is in cohabitation with or loves stones".

Plate 5.6: *Tafi* (left) and *kiboma* (right). *Source: Author, 2013.*

From the interviews and discussions, we can also see the knowledge about the feeding habits as described by fishers. This is accompanied by descriptions of seasonal migratory behaviour of fish species. This knowledge is used to organise fishing activities and to select appropriate baits. That is how fisheries are classified as food, bait or poisonous. When viewed from an indigenous taxonomical perspective, we infer that the meticulous categorization of a function of the special treatment given to fish should be seen within a set of conceptualizations that approximate them to man since both form the articulation between land and sea.

From the scenario above, for the Giriama, we can deduce that those categories of animal species found in the sea and mangroves that are important to the community's needs are easily named and listed. This may be attributed to the linkage between language, culture and cognition. In essence the people in this society may be aware of numerous species of animals in the sea, but only those linked with linguistic, cultural and cognitive significance are easily listed upon enquiry. This is the basis of the cognitive mapping of resources, which is a function of cultural ecological taxonomy, the antecedents of indigenous knowledge.

From the descriptions and classifications above, we can infer that indigenous fishing knowledge among the Giriama should not be viewed, judged or even seen as pre-logical or pre-scientific. As the findings demonstrate, their traditional and ecological knowledge is based on long-term observation of recurrent natural phenomena. This, then, allows fishers to make informed decisions about the timing of activities in the sea. It also allows them to make decisions about the selection of favourable and productive or fertile fishing locations and the use of appropriate techniques for specific species. The use of techniques appropriate for specific species is based on detailed knowledge. Without this fine-tuned knowledge it would be impossible for fishermen to earn a livelihood within an ever changing and frequently dangerous marine environment.

The findings also suggest that there is a strong relationship between how the fishers perceive the physical characteristics of the ocean in regard to fisheries and the social production of knowledge. Among the Giriama people, fishing knowledge is culturally produced and accumulated through professional practice and continually recreated according to the features of the maritime environment. In the interviews and discussions, the knowledge presents itself as cyclic, mobile, and unpredictable. For the fishers, this means that the appropriation of the sea and its resources is expressed in the principle and practice of indigenous technology about the marine territory. What is more? This is constructed and ritualised by means of tradition, apprenticeship, experience, and intuition. This know-how is only attainable by those with experience and intuitiveness that comes from understanding what tradition is in specific cultural and work/production contexts of fishing.

From the classification above, it can also be observed that, sometimes, different species are given the same local name. Examples include *fute, gona* (Plate 5.4), *kambisi, kangaja, kole kole* (Plate 5.4), *kotwe, kufi, mkundaji, kwangu, mweru, pamamba, panga, papa, sonyo, pono, suli suli* and *tafi.* This is a function of local nomenclatural and taxonomical rules. The fish are named according to physical features or behavioural patterns. According to Giriama taxonomy and nomenclature, different species which have the same physical features could as well be the same type of fish. In the same vein, those species though having different physical characteristics but exhibiting similar behaviour, could as well be placed in the same group.

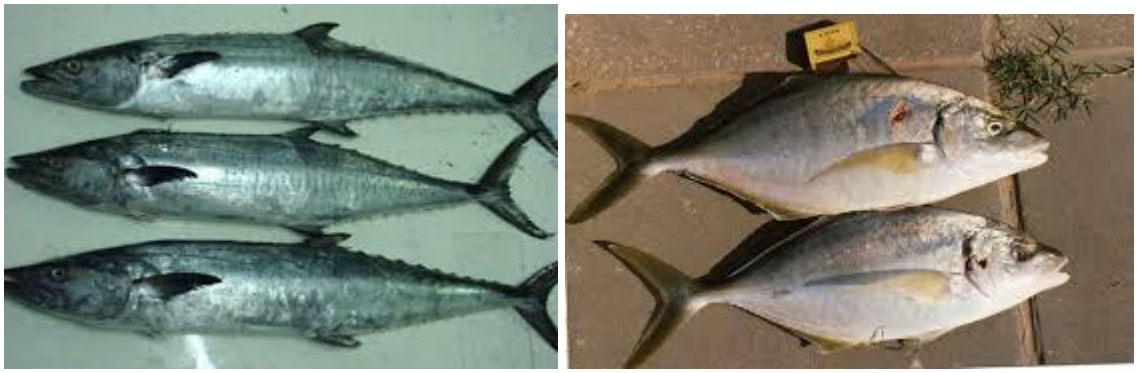

Plate 5.7: King fish (left and yellow spotted king fish (right): Both are named kole kole. *Source: Author 2013.*

In some instances, the names of fish in different taxa are highlighted by extending the name of the fish. These include *kasa, mkunga, pamamba, panga, papa, pono, tafi* and *tewa*. For the Giriama, this helps in naming sub-species. This could be the same species, but differentiated by physical features or behaviour. If there are marked differences in the characteristics, then the second name qualifies the differences. Then we have species with more than one name. These include *kolekole/mwewe, mleya/ nyeya and ndondo/dondo.* These are names emanating from different areas or adoption of foreign names for purposes of easy identification. We can, by extension, infer that because fish are important food sources, they are of special interest to the Giriama and the naming reflects a higher level of specificity for them.

This naming system is a testimony to the fact that the scientific system of classification is neither natural nor universal. It is artificial since it is a cultural construct. This is not to disparage or repudiate its usefulness to organisation. It is only to submit that it is not in our academic interest to dismiss other forms of classification. This is especially so when

they prove illustrative of relationships between organisms, their environments and human beings. As anthropologists and other scholars we have to recognise and study the ways in which different cultures organise their world, the basis of the neo-structural framework. Investigating these systems of classification is useful in outlining the views of indigenous peoples, such as the Giriama, about how animals and plants are categorised and how indigenous cultures relate groups of species to the universe.

From a conservation perspective, this indigenous naming system would be a good starting point to characterise how resources are used and managed at the same time. The reason is that investigating whether a culture groups a particular animal or plant by morphology or function may help conservationists gather information as to which species are targeted and are economically or culturally important. This is because the above taxonomy includes the species which are eaten, those which are not and those which are sold and so on. Similarly, the classification reveals the relationship between the perceived importance of a given species to culture and the number of words used to describe it.

5.5 The Relationship between fisheries, mangroves and corals

The Giriama have internalised the strong symbiotic relationship, which connects the mangroves, fisheries and corals in regard to food, energy levels and waste disposal. It was observed that that mangroves are found in muddy conditions. These areas are fertile for the generation and growth of the species. According to the women's FGD in Matsangoni:

> *The mangroves and corals play complementary roles in keeping strong waves from invading land. Where there are mangroves, there are no corals, and vice versa. Mangroves break the full force of the ocean currents hence prevent the corals from breaking. At the same time, there are fish species found in the mangroves only and those found among corals only such as octopus and prawns.*

Furthermore, a large number of fish species utilise mangrove areas as larvae, juveniles or adults. The fish fauna, however, overlap considerably between coral reefs, rocky bottoms, sea grass beds and mangroves indicating strong linkages between the three ecosystems, with the greatest diversity being associated with the coral reefs (See Table 5.6). According to Mzee Mfuko:

> *Mangroves provide important refuge and feeding grounds for the species. Those species which are hunted avoid predators by migrating into mangroves during high tides.*

Corals are related to mangroves and fisheries in that they are breeding grounds for the fish and they are also food for some fish species. At the same time, corals also prevent erosion and so protect the mangroves. In addition, corals have caves that store water for the mangroves and break the ocean currents for the safety of the mangroves. The most critical relationship between these resources is the storage of water in the case of the corals. This stored water helps both the fisheries and the mangroves. Water is made available to the fish and also to the mangroves. According to one key informant from KMFRI:

> *Mangrove trees act as sinks which concentrate pollutants such as sewage, toxic minerals, pesticides, herbicides and trap sediments. The impact of pollution and sedimentation on reefs ranges from coral bleaching to death. Mangroves are common in sheltered bays and estuaries, providing shelter to many important fish species and prawns.*

For the Giriama, perceptions of the environment act as a powerful cultural model of reality that determines people's behaviour within the environment. This model allows them to order the incomprehensible mass of information from nature, and acts as an interpretive "filter" through which behavior in the environment is made rational. They then base their decisions on the environment as they perceive it, not as it is, and the information of the natural world is coded in the culture and situated in the social context. Using this context, the natural environment is organised into discrete mental principles that constitute the basis for behaviour within the environment. These organising principles form an important source of knowledge and its activation into behavioural patterns, which constitute an important link into understanding resource use amongst the Giriama.

That is why natural resources are classified according to several cognitive criteria. In their cultural model mangroves, fish and coral reefs are categorised into ritual and non-ritual species. The cultural model acts as a precursor for the classification principles that the Giriama have developed due to close association with the natural environment. In their indigenous taxonomy, mangroves and fisheries are identified and named according to use, thus making it a functional classification. However, the Giriama knowledge of marine resources exceeds just utility functions as the morphological taxonomy reveals detailed principles of classification based on physical and other criteria. Mangrove trees, for instance, are distinguished by criteria such as use, height, location, canopy area, leaf size and texture, and fruiting patterns. The same applies to fisheries and corals.

CHAPTER SIX

INDIGENOUS MARINE RESOURCES MANAGEMENT SYSTEMS

6.1 Introduction

This chapter examines the indigenous Giriama systems of marine resources management systems and their relationship with conservation of marine resources. These include beliefs, taboos and regulations that govern the use of fisheries, mangroves and coral reefs. They are expressed in direct prohibitions and bans in certain areas or seasons as well as restrictions on entry into parts of the ecosystems or entire areas. Their expression is also found in proverbs on various aspects of the marine ecosystem and resources, which cement the importance of these resources to the Giriama people.

6.2 Overview of beliefs on marine resources

The Giriama people have the knowledge and technology which makes it possible for them to adapt to their environment. Their culture, as demonstrated in their indigenous knowledge, is a major way of managing the fragile mangrove ecosystem. A major aspect of their culture which demonstrates the importance of the resources to the people is a system of linguistic genres, beliefs and rituals related to the marine resources. This is a system of rituals, taboos, proverbs, songs, curses and spells that touch on the marine resources.

One of the enduring aspects of the Giriama cosmology is that the sea is home to many evil spirits which should be dealt with carefully. Their temperament is very fragile. That is why different rituals are performed on land and the sea. Besides, mangrove forests and corals are regarded as property of the ancestral spirits. That may explain why, in some instances, the Giriama elders enforce seasonal bans to sections of the mangrove forests or prohibit entry into entire forests. The same applies to fish, corals and coral reefs.

Thus, many rituals are performed in the sea and mangrove forests as part of natural resources management. One of the rituals is that performed at the beginning of the fishing season presented earlier. It is one of the many rituals performed in the sea or concerning the sea by those directly associated with it such as fishers and mangrove workers. There are many others. For instance, there are instances where people drown in the sea. Those

victims of drowning may be directly associated with the marine resources such as fishers whose boats capsize in the deep waters, those who may be working in the mangroves or those just swimming. The Giriama people believe that the sea is inhabited by plentiful spirits. Most of the spirits are very harmful. This is the essence of *majini*, the famed water spirits. These spirits are associated with satanic activities such as sorcery. According to Mzee Mfuko of Mtwapa:

> *There are instances where people are lured by spirits into the sea and they drown. Such people are usually culprits of environmental degradation and pollution of the environment. We also have those who have committed various crimes in society such as sorcery, defilement of children, incest, rape or theft. Such people are not good and the society always prays that they be removed. But you know no human being has the power to cut the life of another one short. The spirits do it for us. The sea spirits lure them into the water from wherever they are and they will drown. At times, some people become insane and drown in the sea. These are consequences of deviant behaviour in society.*

Apart from the many evil spirits associated with it, the sea is also considered the safest place to dispatch bad effects of society, such as sorcery. In this community, it is believed that sorcerers install their malevolent formulae in pots, which are buried in the ground in homesteads or near river banks. Thus, sorcerer hunters go for those pots and once the pots are unearthed, they are thrown into the sea. In that case, it will be difficult for anyone to try and retrieve them. The running thread in the belief system is that the sea provides a safe haven for dealing with sorcery in the community. The vastness and immensity of the sea makes in difficult, almost impossible for sorcerers to reclaim their paraphernalia from the sea and continue with their malevolent pursuits.

In regard to the mangroves, the respondents believe that each tree belongs to the ancestral spirits. Species with medicinal values such as *mchu (Avicennia marina)* are highly valued. The roots, barks and leaves have active chemo-therapeutic properties. According to one male elder from Kisauni:

> *The ancestors not only direct the herbalist to the right tree but also instruct him or her on the amount of dosage to be administered.*

6.3 Proverbs touching on marine resources

Interconnected with the aspect of rituals, is a system of proverbs that are associated with marine resources. These proverbs form part of the corpus of values and beliefs that maintain the structure and function of the Giriama culture. The proverbs may be used in

common conversations as a way of demonstrating versatility in language use. However, inherent in their deep meanings are lessons on various aspects of marine resource management. Some of the proverbs are given below and their link to marine resource management illustrated in the succeeding section:

(1) *Ndio mwanzo mkoko unaalika mauwa* – "it is just the beginning; the mangrove tree is yet to invite its flowers". One meaning of this proverb is that the mangroves should be allowed to mature before they are utilised. It may also be interpreted to mean that one should not look at an old mangrove tree and dismiss it as useless. It still has value. The proverb warns against dismissing things off hand due to first impressions. The moral teaching of the proverb is that we should not despise or destroy anything because everything has a value and that is the reason it exists.

(2) *Mlinga ndio mkoko* – "the testa or propagule is the mangrove tree".

Mlinga is the testa which contains the seeds of the mangroves. This proverb teaches appropriate family morals about child rearing. Equated to human beings, the proverb highlights the relationship between the young child and the adult product of socialisation. The moral of the proverb is that the seed of the tree, like a human child, should be taken care of properly since it is the source of life in the mangrove forest. In the same way, we should take care of children for the survival of the community.

(3) *Mkoko huleta neema* – "the mangrove tree is the source of grace, favour, mercy or blessings".

The moral teaching is that people should not look far for these virtues from just anywhere. They are to be found in the most unusual and common places. We take a deeper connection with the importance of the mangrove ecosystem to the wellbeing of the community. Thus, it is only fitting that the community extolls the virtues of conserving the forests for they are actually a source of prosperity.

(4) *Mkoko ni kama roho* - "the mangrove tree is like the heart".

This ecosystem is the heart of the environment among the Giriama people. It is very important, just like the heart is to the whole body of an organism. In this case, they are referring to the human being.

(5) *Ngangari kama mkoko* - *"*hard or resilient as the mangrove tree".

The proverb teaches people to be strong-willed so as to withstand any challenges that they face in real life. In actual fact, life is like the surroundings of the mangroves, full of ups and downs and it requires the fortitude of the mangrove tree to sail through. This proverb is sometimes used in reference to men who are sexual athletes, those with the sexual staying power. Given that this community is polygynous, men who marry more than one wife are regarded as sexually strong, the ideal men. However, a polygynous marriage is bound to experience a lot of turbulence, just like the mangrove environment. Thus, mangroves are metaphorically associated with virility, staying power and endurance.

(6) *Avumae baharini papa, lakini wengine wamo* - "it is the shark which is best-known in the sea, but there are many others".

The teaching is that no one is indispensable. No particular individual can make up the whole community, however strong or famous. His or her existence is tied to the existence of other individuals in society.

(7) *Tunza mikoko ikuhifadhi na majanga* – "protect the mangroves so that they also protect you from disasters".

This proverb is tied to the interdependence among all organisms in an ecosystem. It also points to the importance of the mangrove forests in protecting not only humans but all those other organisms dependent on it.

(8) *Tunza mazingira yakutunze*- "protect the environment for it to protect you".

This proverb recognises the fact that the environment is the source of everything that humans require for their survival. Thus, it is only prudent to take care of it.

(9) *Mazingira ni uhai* - "the environment is life".

This proverb asks for prudent use of environmental resources. The reason we are called upon to take care of the environment is because our fate is entwined with that of the environment. Our lives depend on a clean environment. Therefore, conserving the environment is the same thing as preserving your own life.

(10) *Mwenda tezi na omo marejeo ni ngamani* - "whether one goes forwards or backwards, one must come back to the middle of the raft to control it".

While the moral is steadfastness in whatever one is doing, it has immense implications for those who join a fishing expedition. It may imply that leaders of expeditions must be upright individuals who can be relied upon by the rest of the crew. At the same time, elders should set a good example when guiding young people. Those who go fishing are warned to concentrate on the business of fishing and never joke with the sea as it is unpredictable.

(11) *Hasira ya mkizi furaha ya mvuvi* - "The anger of the mullet/cuttlefish is the joy of the fisherman".

Folklore tells us that the angry cuttlefish, when caught on the line, will jump out of the water into the boat of the fisherman. The moral of the proverb is that an angry person hurts himself most often.

In these proverbs we can see that natural resources play an important role in the day-to-day activities of the Giriama community. We can also deduce that that mangroves, fisheries and corals are an integral part of culture among the Giriama. They may as well be the pillar of metaphor that not only enhances stylistic communication but also imbuing the people with ethos which are instrumental in shaping an acceptable society.

6.4 Taboos and beliefs about marine resources

Apart from proverbs, there are taboos related to the utilisation of marine resources. These include taboos against eating certain marine species because of beliefs based on religious influence or superstitions of the local community. The taboos are based on fears of poisoning, impotence, spots on the skin and ill effects on unborn children. The presence of sacred mangrove forests is a case in point. In the research area, there are many sacred mangrove forests. Some of the forests are used by fishers and other community leaders to perform rituals. Impure people are not allowed to enter these forests and it is forbidden to cut down a mangrove tree in this forest as this will lead to misfortune and/or death.

Some of the mangrove forests are believed to be associated with evil spirits and it is forbidden to cut down mangrove trees here to avoid health problems. Another taboo

related to mangroves is the prohibition on cutting down a tree, which you do not need immediately. This is enforced by elders. The sacred mangrove forests are presented in the section below, and reasons are given as to why they are considered sacred. One of the sacred mangrove forests is kwa Mwakirunge mangrove forest in a place called Mwakirunge in Kisauni. The name literally translates to mean Mwakirunge's place. The forest is named after a person called Mwakirunge. According to one of the male respondents:

> *It is not known why the forest is sacred. All I know is that Mwakirunge was a healer and an oracle. He used to live near the shore and he would consult the spirits in the adjacent mangrove forest and provide solutions to various problems. It is believed that even though he is dead, his extra-ordinary powers have allowed him to protect the forest. We, therefore, do not under any circumstances, go into that forest. It is forbidden for any ordinary person to go into the forest.*

Then there is Kwa Kipicho mangrove forest, also located in Kisauni. The forest is found at the extreme end of the Mtwapa Creek. According to one male respondent in the area:

> *It is named after a person called Kibicho, who was a great prophet and medicine man in the Giriama community. In fact, it was him who used to give individuals permission to go fishing or cut mangrove trees. No one would defy him since fishing and mangrove cutting were sacred activities only permitted by revered individuals who had the power to communicate with ancestors and spirits. This forest is extra-ordinary. The most interesting thing about it is that there are a lot of baobab trees in the adjacent land. Among the Giriama, the baobab is a sacred tree. Having it near a mangrove forest is an amazing phenomenon. For us, we believe that Kibicho is still lurking in the area, protecting his dwelling. As such, elders use the forest as a shrine for rituals and other secret society events.*

We also have the Custom mangrove forest in Mtwapa. Legend has it that a long time ago, even before the Portuguese came to the coast of Kenya, part of the Mazrui family used to live there. They established homesteads, mosques, and cemeteries. With the migration of the family and abandonment of the homestead, the houses and mosques collapsed and the cemeteries were abandoned. This made the mangrove forest expand and cover part of the former homestead and graves. At the same time, there was a *panga* (temple or sacred place) where people used to pray. This has transformed the forest into a sacred mangrove forest. The implication is that the forest is a massive body of mangrove species and other organisms that rely on mangrove forests for food, spawning and protection from predators. The sacredness of the place emanates from the many caves which have been transformed into holy places due to the shape of the stones that make up the caves. The stones are triangular, making them look like they were carved.

Another sacred mangrove forest is *Jumba la Mtwana* (the male slave's big house) in Mtwapa (Plate 6.1). It is believed that another part of the Mazrui family lived in this place, which was the palace which later became a shrine. It is engraved in the mangrove forest. Elders perform rituals in this shrine.

Plate 6.1: The ruins in *Jumba la Mtwana* mangrove forest in Mtwapa. *Source: Author, 2013.*

Furthermore, there is Matsangoni forest (Plate 6.2), near Matsangoni town, just after Kilifi town towards Malindi. This forest derives its name from the Giriama word for womb. Its name actually translates to mean inside the womb. Among many indigenous communities in Kenya, the womb is considered a sacred part of the human anatomy since it is where life actually begins. This mangrove forest is considered the largest sacred mangrove forest. According to the respondents, Giriama elders periodically hold ceremonial events to cast away evils as well as ask for blessings and forgiveness from their gods and ancestors. The ceremony starts from the mainland and ends up in the mangrove forest where the elders take the lead in casting evils. The forest is considered sacred because the people believe that evil spirits come from the ocean through this area to cause havoc such as numerous unexplained deaths and poor harvests. This prompts elders to organise ceremonies to return the evil spirits to the ocean. Thus, the mangrove forest is considered refuge to evil spirits and no one is allowed to enter it for any reason other than the elders who perform cleansing ceremonies.

Plate 6.2: A path leading into Matsangoni mangrove forest in Kilifi County. *Source: Author, 2013.*

Then we have the Vuma Mangrove forest in Takaungu. According to the men's FGD in Matsangoni, this is one of the mangrove forests where, up to date, there are various ceremonies that are still performed there. It is notable that the adjacent area to the forest is Arab-dominated. The Arabs conduct several ceremonies inside the forest as thanks-giving to their God as well as fortune seeking. Their traditions are still very strong and people are scared of tempering with the forest for fear of punishment from the Gods.

The most popular ceremony that takes place here is *kutoa chanu* (thanks-giving). During this ceremony, elaborate rituals are performed. These include taking valuable minerals like gold and silver, which are put in a small vessel (*chanu)* and then they are burnt in *udi* (a kind of pan) together with bananas. The Arab elders also slaughter animals like chicken and goats in the mangrove forest, cook rice and meat and go deep into the forest to offer a part of the food as sacrifice which they believe their gods will eat and then bless them. The remaining part of the food is eaten on the sandy shore while they dance to traditional songs and drums.

Next are Maya and Ushini mangrove forests surrounding the Kilifi Creek, near Kilifi town. These forests are considered sacred because there is a magic island between a place called Mtongani and the forests. This is a very small island that can barely be a homestead. However, the island has never been swallowed by water as long as people can remember, in spite of its size. Even if the winds are strong and the waves high, the island has never been submerged. The Giriama consider the island and the adjoining forest

sacred. They have, therefore, transformed the island and the forest into a shrine, a place where people pray to their gods and ancestors when someone wrongs them such as stealing their property or when a family member has been killed. Mzee Hamisi Magogo, who oversees the shrines on the island and the mangrove forest, had this to say:

> *When one prays to the ancestors on the island and forest, punishment immediately comes to the offenders.*

In the same breath, some mangrove species are considered sacred. In particular, medicinal mangrove trees such as *mchu (Avicennia marina)* (Plate 6.3) and *mkandaa (Avicennia tagal)* are highly valued. According to Mzee Hamisi of Kikambala:

> *Their roots, leaves and bark have active medicinal properties. Therefore, we have taboos to ensure that these trees are protected and allowed to replenish for posterity. That is why not everyone qualifies to undertake indigenous medical practice. It is the preserve of particular families, lineages or clans. This makes sure only those who know how to relate with the trees are allowed to deal with them. Can you imagine if everyone was allowed to deal with the trees? How would they know which tree is sacred and which tree is not sacred? All the trees would be gone by now.*

Among the Giriama, the sacred mangrove forests cannot be cut down simply because it feels wrong for the environment. Following this up I noted that it is possible to take this deeper and conclude that putting thoughts about the environment on one side and the feelings of the community about the same environment on the other side not only leads to the community losing their connection with the environment but also gives them a feeling of disorientation, disconnection and loss of their sense of balance. These connections are lost. That is why, as the elders noted, trespassing through sacred mangrove forests hurts to a very deep level, making conservation of the mangroves much more than an environmental issue.

The forests are related to healing, which is a sacred calling that is practised mainly by women. These women know a lot about mangrove species that have medicinal value. Their knowledge has a very important implication about the relationship between the community and the mangrove forests. The forests are an essential component of the healing practice since they are a source of herbs and roots. Therefore, the mangroves are tied to the health of the community, through the health of individuals within the community. Thus, mangroves are revered sources of wellness (*uzima*). Humans transform this wellness from the forests through the art of healing. Healers are the custodians of all

forests, mangrove as well terrestrial. The healers know a lot about the mangrove species that have medicinal value.

Mangrove forests in general and the sacred ones in particular are tied to well-ness in the community. Entry into the forest for herbs and roots is a function of commands from spirits. And harvesting medicinal parts of the trees requires spiritual guidance. So if the spirits require a healer to fetch medicine from the forest, they usually command the healer to a particular tree; needless to observe that there are numerous similar trees in the forest. The healer, therefore, has to do as commanded and go to that particular tree.

The sacred forests are considered places of holiness. They are sacred shrines. Some special prayers and sacrifices are held in these forests. They function as places of worship. Indeed, through observation, I noted that the sacred forests were thick, and largely undisturbed with dense and luxuriant growth. There were no signs of freshly cut trees within the forested area; there were no tree stumps. In fact, in all the sacred forests, there was only one designated route leading into the forest and no other access route was visible (see Plate 6.2).

The declaration of mangroves as sacred or spirit-infested has the effect of restricted entry and this has the implication of allowing the forests to flourish without interference. In the process, the mangrove forests, especially those dominated by the *mchu* species (see Plate 6.3), are a mass of luxuriant growth that protects those marine species that hide there in fear of their predators. Besides the forests provide a perfect haven for spawning some species as well as food for those species that depend on them for food, as primary feeders, secondary feeders or even tertiary feeders. The restrictions also facilitate the emergence of biodiversity in the forests.

Plate 6.3: *Mchu* mangrove species which is considered sacred. *Source: Author, 2013.*

Apart from the restrictions regarding mangroves, there are strict taboos concerning the sea and operations in the sea, especially fishing. It was illustrated earlier about the elaborate rituals that are undertaken at the beginning of the fishing season. Likewise, there is strict observance of prohibitions and rules of conduct before fishing gets underway every day. There are restrictions on joining a fishing expedition or even individual fishing in the sea before bathing after sex. This is due to a belief that having intercourse ritually pollutes the body. According to Mzee Mfuko of Mtwapa:

> *The ocean is the home of evil spirits and, according to our beliefs, the spirits dislike meeting with an impure person. This taboo must be strictly adhered to so as to avoid misfortunes during fishing activities.*

Related to this taboo is an observation about fishing without success. It was reported that if a hand line fisher goes out fishing and spends some time without any success, he does not continue but rather returns home because it is a sign that something is wrong at home. For example, his wife could be having sex with another man or there may be a death in the family. Hand line fishers also cancel fishing activities if they hook up a bottle from the ocean, which is a bad sign. This then restricts fishing and in the process preserves fisheries.

There are also restrictions on fishing for menstruating women. According to Giriama beliefs, a menstruating woman is considered impure. She is not allowed to mix with other people. Additionally, to avoid misfortune, it is taboo for a menstruating woman to go fishing. This taboo involuntarily protects fishing habitats on the near shore reefs.

Among the Giriama fishing is undertaken at given times of the year when the sea is thought to be "fertile and welcoming". However, even during these times, the sea can decide to be rough and unwelcoming. There are signs that it is not safe to go fishing into the sea in groups or individually. Thus, there are restrictions on fishing during strong winds and heavy rains. It is taboo for the artisanal fishers to fish when there are normal or unexpected heavy rains and strong winds. This unintentionally allows some marine fish species to breed and grow. According to Mzee Mfuko of Mtwapa:

> *This is time the sea spirits are getting rid of bad elements in their midst. If one goes into the sea at this time, one will interfere with the rituals of the sea and one is likely to face the wrath of the spirits. This may lead to illness or even death.*

Sometimes fishers get lost at sea and this presents another scenario of beliefs and taboos regarding fishing and operations in the sea. When a fisher gets lost during an expedition, other fishers do not continue fishing but rather search for the lost fisher until he is found, dead or alive. It is a taboo observed to show respect for fellow fishers, even if they are from as far as Vanga in Kwale County, on the border with Tanzania in the south, and Kiunga in Lamu County to the north.

Related to this are death events. When there is a death event in the village, no fishing activities take place until the body is buried. According to the respondents, if this taboo is not observed, misfortunes would occur, for example, if you went out to fish while others were involved in burial activities. This taboo inadvertently limited pressure on marine habitats in the study area. Nowadays, this is not common in some areas, but in some places like Matsangoni and some places in Shanzu, the practice still exists although it is not as strongly adhered to as it was in early times. Today some people continue with fishing activities even if there is a death in their villages.

According to Mzee Mfuko of Mtwapa, mentioning names of terrestrial animals is prohibited. In some fishing communities, for example, in Matsangoni and Kanamai villages, fishers cancel fishing activities if one among them inadvertently mentions a name of a terrestrial animal. According to him:

> *This is considered to be a sign of bad luck. Related to this is alcohol consumption. It is taboo for coastal fishers to drink alcohol when going out to fish. This taboo is connected to the Islamic religion which says that consuming alcohol makes the body impure. If a*

fisher is identified by others as having consumed alcohol, he is dropped off to avoid misfortune and other dangers during fishing.

This again helped to minimise fishing and allowed the fisheries to breed and grow. It can, therefore, be regarded as an inadvertent conservation technique.

Another related taboo concerns meeting with one particular person. In Mtwapa, it was reported by the men's FGD that that some fishers cancel fishing activities if, when going out to fish or check nets/traps, they meet with a particular person. For instance, if the person going fishing has a son as first born he considers women as a bad omen. This is believed as a bad omen on that day as nothing will be caught. On the contrary, it is considered a lucky sign to meet a man. On the other hand, meeting with two or more people of whatever gender when a fisher goes out fishing is considered a good omen. The implication is that if many fishers were to avoid fishing on account of this taboo in a day a lone, many fisheries would be preserved in the process.

Impurity of fishing vessels and gear is another important aspect of restrictions on fishing. In Shanzu and Bamburi, it was reported that fishing vessels and gears must be free from impurity of any kind. For example, fishers believe that nothing will be caught if a goat urinates on the basket traps. It is also taboo for fishers to defecate or urinate inside or nearby the fishing vessels. If that happens, it is believed that nothing will be caught on that day. The implication is that should one of the fishers relieve himself near the fishing vessels or gear, the fishing expedition will be suspended for that day until the vessels or gear are cleansed. This is because ancestors and other spirits that guide fishing will be angered and the fish will run away from the pollution. The cleansing is only undertaken by a recognised healer. If the healer is not readily available, the fishers will have to wait until such a time that he will be available to cleanse the vessels or gear. This, in a way, restricted fishing and thereby conserved the fisheries.

Then there is the belief in the magical power of some events. Fisheries in coastal communities have long been associated with innumerable magical practices. Some fishers believe that, in order to catch more fish, a talisman must be tied to the fishing gear or vessels, and/or a prayer must be said in order to give fishermen confidence in the face of a wide range of hazards and threats. According to Chai Bakari of Kanamai:

> *A traditional healer should be consulted to find the best time and day to leave home and the best direction for fishing and camping. In addition, some fishers believe that a big tree found along the coast is a home of evil spirits, so a special prayer must be said before cutting down the tree for vessel construction to avoid misfortune*.

In the absence of traditional healers the number of fishing vessels is greatly reduced and, thus fishing pressure is reduced and fishing habitats are protected. Another related belief is that, when a person drowns in the sea, a lot of fish appear in large quantities, the catch of fish is also usually very high.

Apart from the taboos and restrictions on fishing, there are fish species which are considered sacred. These include *mkunga* (snake fish [eel]), *bocho, nguva, tsovya, chale,* and *ngogo*. *Mkunga* is believed to be the protector of other fish species. Its name is derived from the title of a traditional birth attendant or mid-wife. This is a very important person in the community as she is the first person who comes into contact with a new born, even before the mother herself. She procures, guides and protects new life. Likewise this fish protects other types of fish and is taboo for food. Thus, if one catches it first, that fisher should abandon fishing as he will get nothing or may end up in misfortune. It is also highly poisonous.

On its part, *bocho* (stone fish) is also a bad omen and represents ill luck or misfortune in the sea similar to *mkunga*. *Nguva* (mermaid fish) is a type of fish that is half-human and half-fish in physical features. In regard to restrictions, it is believed that sometimes it falls in love with fisher men and if such a thing happens in the deep sea, the boat will capsize and the object of its affections will drop into the ocean never to be seen again.

The community also has beliefs and taboos concerning corals. In Mtwapa and Kanamai it was reported that spirits protect some coral reefs. Thus, traditionally, some reefs remain untouched and healthy due to unexplained events that were observed by fishermen during fishing. Information on the presence of evil spirits in some reefs was spread to others orally. Some of the beliefs are illustrated in the succeeding section.

Some reefs are declared shrines and used for traditional rituals to avoid misfortunes. The rituals are performed for various reasons, although the main ones are for averting

misfortunes in the community or atoning for immoral or criminal activities such as adultery, incest, sorcery, murder and rape and are performed any time they are required. Those rituals concerned with fishing activities are usually performed when the fish catch decreases. Thus, impure people are not allowed to go in these areas and neither sweet foods nor perfumes are permitted into the reefs. In addition, many people do not fish in these areas to avoid death and any other ill-luck. Likewise, there are some reefs which are associated with evil spirits. It is believed that the evil spirits use such reefs to conduct their prayers thus making people afraid of fishing in these areas, especially at noon and on Fridays.

In Kanamai, because of the presence of evil spirits in some reefs, Chai Bakari reported that an offering of special food must be made. For instance, in order to catch more fish at some reefs, three days before fishing, a cooking pot containing sweetmeat, dates, sugar cane and ripe bananas and covered with a lid, must be prepared and placed at the reef. It is a condition that the food must not be tasted. At the same time, when fishing at some reefs and your body is impure (for example, fishing before taking a bath after sex or gleaning for menstruating women), you are likely to see extraordinary creatures such as large octopuses and crabs. To avoid supernatural sanctions such as becoming seriously sick and dying, fishers are required not to shout once they see such extraordinary creatures. Also fishers might become seriously sick and may end up dead if they eat sweet things at the reef without throwing parts of them into the four directions of the earth.

It should be noted that most stones that are considered sacred are not in the sea but, rather, on the shore. They are popularly known as *mango/pango* (caves). People go into the *mango* to pray to their gods. One of them is found adjacent to the Maya mangrove forest along the Kilifi Creek. Then there are the black stones at Ushini mangrove forest. Another sacred coral is Kajiwe cha Chonyi (Panga-Temple), the small Chonyi stone. This is a coral within the Indian ocean close to Custom Beach at Mtwapa which was a place that the Chonyi sub-group of Mijikenda used to perform rituals (*kafara*) or sacrifice and pray to their gods. The place is considered sacred. Individuals are not allowed to swim or fish near the coral. It is believed that there is a big cave inside the water where the spirits live. Although the rituals are no longer performed, the beliefs about the presence of spirits which are very sad make people avoid the place. It is

believed that anyone who approaches those corals could sink into the caves and not be seen again, dead or alive. This inevitably preserves the area and facilitates the conservation of resources.

During the transect walks the research team was led to the Mtwapa Creek, where it is believed there is a big cave in which a big *tewa* (rock) fish lives (Plate 6.4). This is the basis of *Shimo la Tewa*, the cave in which the rockfish lives. Thus, the creek is named after the rockfish, a local delicacy. This creek is revered among the Giriama. Fishers are afraid to fish in it during the South-east monsoon winds due to the belief that during that period if one dies there, one's body will never be seen and, hence, that person's corpse will not be accorded proper and formal burial rites. This fish is considered a harbinger of good omen for fishing. In the past, legend has it that it would emerge from the water and this would bring a big catch on whoever saw it. So the elders used to pray for the *Tewa* to come out of the cave as this would be a sign of blessings.

However, if it remained inside the cave, this presented a bad omen and it was interpreted as having been made angry by people and so did not want to meet humans. Phenomenally, the G.K. Prison at Shanzu was named after Shimo la Tewa since being locked means one has committed a sacrilegious mistake that even the community cannot forgive. Such a person is compared to one who has angered the big rockfish such that he has been condemned to actually drown in the creek. From these findings we can discern a link between indigenous knowledge and belief. And this link portrays the influence that spirituality, laws, norms and values have on how people act within their ecosystem.

Plate 6.4: Mtwapa Creek, where the big rockfish (*Tewa)* is believed to live. *Source: Author, 2013.*

6.5 Emerging issues for sustainable marine resources utilisation

During the study, a number of issues related to sustainable management of marine resources came to the fore. For many years the management of the marine resources was placed in the hands of elders in the community. These elders enacted rules and regulations that dictated how the resources would be harvested. This is the basis of indigenous management regimes. Some of the indigenous methods of conservation were rotational extraction of mangrove, fishery and coral resources. For example, mangrove cutters would harvest trees and tree products from one area and then proceed to another after exhausting the mature trees and their products in that area. Another technique was to place a taboo or restriction on entry to a given area of the forest for some time due to ritual pollution or mistreatment of the trees through wanton destruction. The elders would also declare a certain species or part of it sacred for some period of time. The same would apply to fisheries, corals and coral reefs.

These rules were in place because the Giriama people depend a lot on their environment and this makes them pay attention to it. Until the gazettement and nationalisation of mangrove and other marine resources the marine ecosystem was considered a common-land or the social property of those who were charged with its care. Thus, everyone in the Giriama community was expected to ensure proper utilisation and management of every resource in the ecosystem. This is the basis of an indigenous conservation ethic cultivated within the community.

With the nationalisation of the resources, came in a new management structure which removed the mandate of management from the community and placed it in the hands of the government. The current management regime is premised on the idea that the community does not have the capacity to manage marine resources prudently. One of the issues emerging from the study in regard to the management of the resources concerns the location of the management responsibility where some respondents and key informants believe that those mandated to manage the marine resources are abusing the trust bestowed upon them.

With the change in the management regime, the State Departments of Environment and Fisheries are the ones which currently coordinate issues concerning natural resources

management in the country. It is under these departments that the Kenya Forest Service (KFS), Kenya Wildlife Service and Kenya Marine and Fisheries Research Institute (KMFRI) fall and these are the bodies mandated to manage marine resources in different capacities. For instance, the Kenya Forest Service (KFS) operates a licensing system that allows people to operate in the mangrove forests as timber harvesters or firewood collectors. The management regime, according to KFS and KWS officers, is very appropriate. It makes it possible to keep poachers and those who want to over-exploit the marine resources out of the mangrove forests, away from the corals and out of the sea. According to one of the KWS officers:

> *The state corporation maintains marine parks and game reserves. This helps to regulate fishing as some of the people who fish do not have appropriate gear for fishing. Once fish are in the Marine Park or reserve, they are out of bounds for the fishers. This then helps to stem over-fishing and facilitates the replenishment of the stocks in the ocean.*

According to key informants from KWS, efforts have been made for the conservation of the marine resources in the area especially the fisheries. On its part**,** KWS has created marine parks and marine reserves. In the marine parks, human activities such as fishing or disposal of waste, are prohibited. The authorities, however, allow limited fishing in the marine reserves. These sentiments were echoed by the KFS officers, who felt that the local community does not understand the value of the marine resources.

According to them, the level of poverty does not augur well for the preservation and prudent use of mangrove and fishery resources. Until the problem of poverty is addressed, it will be good to protect the mangroves and other marine resources against the rapacious harvesting techniques of the local community. They argued that this is what necessitates the licensing system. They also pointed out that it would be appropriate to educate the local community on the importance of conservation. An officer with the KFS noted that:

> *If you consider the mangrove cutters, for example, the economic realities have made some cutters to be impatient such that they do not allow the forests enough time to replenish after cutting. They exploit the forests to the point of degrading some areas to bare levels.*

However, some of the KMFRI officers seem to have a different perspective on how the local community should be engaged in the management of the marine resources. According to them, the community has something to contribute to the process of managing the resources. One KMFRI officer asserted that:

> *In fact, degradation is encouraged by the government officers who abet poaching of resources in the sea and mangrove forests. I can tell you that from the experience the community has with the marine resources over the eons is enough for conservation. In any case, should the resources be depleted, it is the community that will lose most.*

In examining the ethical issues concerning the marine resources, one of the issues that comes to the fore is the interface between the location of the mandate for the management of the resources and the utilisation of the same resources. According to the respondents, the community values the trees for the forests and not the forests for the trees. The thinking here is that the forests cannot be existent without the trees. This may explain the maxim among the Giriama people that the forests have the right to exist. Taboos and restrictions are in place to take care of the resources. Among the Giriama, breaking taboos and restrictions related to natural resources is considered an act of violence.

This brings us to the question of the ownership of the resources. The question about who owns the marine resources elicited interesting and varied responses. The local people consider the resources to belong to them by ancestral and divine right. The government only came in recently to take over what rightly belongs in the realm of their kinship relations and friendship with the marine resources. However, since the government has very strong laws and instruments, they have no alternative but to follow what it dictates.

On closer scrutiny we discover that the idea of ownership of resources has been very fluid over the years. Some of the resources are owned by the local community and overseen by the elders in the community. This is because the interaction between the community and the resources is important. The community interacts with the resources in a number of ways. Fishers are always interacting with the sea when they go fishing while mangrove cutters cannot do without the forests. Women and girls collect firewood and sea weeds *(mirindi)* from the mangroves. Thus, mangrove forests or parts of the sea, for example, are sometimes declared sacred, where elders carry out rituals for purposes of blessing fishing expeditions or ridding the community of the ill effects of criminal and sacrilegious actions. Such resources are used at designated periods of the year or never at all. According to one respondent in Shanzu:

> *Entry in such areas is prohibited at most or sparingly allowed. These are some of the ways in which the community owns the marine*

> *resources and manages them. These are traditional regulations for the management of resources and no one is ready to disregard them. And breach of these regulation leads to heavy penalties, which only elders can determine*.

There are also rules for the conservation of these marine resources where the community is in charge. In Kanamai, one respondent indicated that there is no picking of shells or anything from the beach. Those who do not belong to the local community-based organisations involved in mangrove issues are not allowed to cut the mangrove trees or even harvest other resources. He also indicated that some methods of fishing such as beach seining and dynamite fishing are not allowed in the areas controlled by elders. In these areas fishers also have traditional fishing rights assigned to them by the elders of the community in a place called '*Palani*'. In this way, community elders are responsible for the decisions and the community protects some species of fish and mangroves.

The foregoing indicates that the Giriama community has developed a conservation ethic in the utilisation of the marine resources. This ethic is part and parcel of their culture, encapsulated in their cosmology and social metaphors through language and rituals. At the same time, it suggests that the Giriama are aware of the challenges to their efforts to conserve the marine resources. These challenges arise out of the interaction between people and the resources, most of which is not sustainable. From the in-depth interviews, key informant interviews and focus group discussions, the running thread of the argument was that the exclusive management of resources by the government is not acceptable across the board. While the KWS and KFS officers were of the opinion that the government was capable of managing the resources on its own, the community and, to a large extent, KMFRI officers, felt differently.

In fact, the feeling among the respondents was that the government's role was to blame for the deteriorating status of the management process. Some respondents argued that some government officers were lax and corrupt and allowed illegal harvesting of resources from the mangrove forests and the sea. At the same time, they allowed not only illegal extraction but also destructive harvesting methods. Some respondents reported that they had actually reported poaching of resources to KFS or KWS officers only for the reports to be ignored. According to the men's FGD in Mtwapa:

> *In the mangrove forests, it is actually the licensing process that is to blame for the degradation. Some licensees corrupt their way into being allowed to harvest trees from larger areas compared to what their licenses indicate.*

From informal interviews, it emerged that some people resort to destructive methods of harvesting resources because they feel the government has forcibly taken over what God had bestowed upon them naturally.

On the status of the marine resources, there seemed to be some rapprochement in the perspectives provided by the respondents from the government side and those from the community's side. On the depletion of fish stocks and mangrove resources, the findings indicate that indiscriminate cutting of trees, commercial harvesting of fish by trawlers and picking of corals for building as well as aesthetic considerations by tourists were to blame. The marine ecosystem is also degraded through pollution by unsustainable waste disposal measures by the industrial and domestic consumer culture. For instance, the respondents are aware of the water problems and pollutants in the regions. As one male elder aged 68 yearsreported in Majengo:

> *Hotels and other industries located near the sea deposit their waste directly into the sea or indirectly into rivers which again flow to the sea. These are a threat to marine plants and animals. Dropping of plastics and polythene into the sea takes away the fresh air that fish and other marine species depend on. When the waste gets to the mangrove forests it covers the roots of the mangroves which kills the mangroves and also suffocates the fish.*

To show that the community is serious about staking its claim to the management of the marine resources, some people have formed community-based organisations to protect and conserve the resources and work hand-in-hand with the government and other institutions concerned with the protection and conservation of the resources. This makes the local community feel that it is fully responsible for the management of the resources. This explains why some respondents felt that it is the moral duty of everyone to safeguard the environment and the resources therein. According to them, the environment belongs to all of us and, therefore, we must be concerned with the state of affairs of the resources. This is the basis of two proverbs:

a) *Tunza mkoko ukutunze majangani* (take care of the mangrove tree for it to reciprocate during disasters.

b) *Tunza mazingira yakutunze* (take care of the environment and it will take care of you).

These proverbs, among other measures to conserve marine resources, arise out of the myriad challenges facing conservation efforts in the research area. The proverbs indicate the importance of the resources to the community. The use of resource names in everyday conversation highlights the elevation of the resources in the world view of the community. The resources are perceived to be part of a very important and elevated social reality. Therefore, the proverbs could be seen as part of the seriousness with which the community takes the conservation of the marine resources. The local people are aware of the accelerating rates of depletion and degradation. It is interesting that in the local ecological knowledge, there are indicator species that show the community that things are not well ecologically speaking. The respondents point to the environmental changes that they have observed over time. Mzee Mfuko told us that:

> *People are aware of the environmental changes and know differences between different areas. They see this change as a continuum. Overall numbers are decreasing. Some species of the marine plants and animals have disappeared completely. We usually look at plant coverage and greenish appearance to describe the differences in the vitality of the mangroves. For example, the mchu is disappearing but it is being replanted by the community. This condition happens slowly and people notify this by them (mchu) being very scattered in the area through consistent exploitation without restoring them through replanting.*

The role of the local community in resource management is emphasized by senior forest and NEMA officers in Mombasa. According to them, the local people interact with resources on a daily basis. This means they are expected by both culture and livelihood pursuits to take care of the resources. They advocate for the formation of BMUs to ensure sustainable use and exploitation of resources. The reckoning is that the laws of Kenya allow communities to play a significant role in the management of resources in their proximity. According to a forest officer:

> *If the fisheries sector is organised, capacity building and resource monitoring will be more efficient. This will actually bring the community into the fold more effectively. What is more sensitization on sustainable use of resources by training people on how to mobilise resources and play their roles will be enhanced. This will also utilise the perception of the community in conservation of marine resources. The community members appreciate the role played by the marine resources in their lives.*

The community members and officers from government institutions were in agreement that development affects the use and management of marine resources. The most cited impact of development activities on the marine resources was the presence of hotels on the shoreline. These establishments encroach on mangroves, fish handling sites and beach

access points. According to NEMA officials, the establishments do not consider the riparian zones as stipulated by the law. Apart from building them close to the sea, they also pollute the marine ecosystem through the disposal of waste in the sea and mangrove areas.

The community blamed the state of affairs on the location of mandate for the management of the marine resources. In this case the local community is of the opinion that the government alone cannot effectively manage the resources. The responsibility to manage the resources should be everyone's. The government should only take the lead role by co-coordinating the various actors. This will enable everyone to take their role and responsibility without any scapegoats. By coordinating various actors such as the local community, private developers, NGOs and research institutions, it will be possible to ensure each actor takes its role seriously. It will also mean each actor will maximise on its strength and be compensated in its weaknesses by the strengths of the other actors. This is the basis of consensus-building in resource management.

This is where an investigation into how Giriama indigenous system of practices (experienced events), belief, and context (CPB) provides an epistemological basis for the understanding of indigenous ecological knowledge for managing marine resources becomes important, one of the objectives of this study. The study was able to identify and discuss the Giriama nomenclature on the marine resources and analyse its basis for managing mangroves, fisheries and corals. Its findings can, therefore, help to describe the ways in which the Giriama ecological knowledge can lead to greater understanding of different worldviews on the management of marine resources.

We can also note from the findings that the community recognises that resources are increasing or decreasing by being keen on the number of species found in the ecosystem. According to respondents in the in-depth and informal interviews, this depletion happens because of the problem of overuse in the area. During the transect walks, we were taken through areas that were degraded (Plate 6.5) and those which were not (Plate 6.6) and the differences were amazing. The Giriama do not condone overuse and depletion of resources that will degrade an area. In case of depletion of the resources, the resource users are advised to relocate to another place where the resources are still vibrant.

Plate 6.5: Degraded mangrove areas in the research site, Source: *Author, 2013.*

Plate 6.6: Lush Mangrove forest (left and centre) and efforts to replenish degraded areas in Kanamai. *Source: Author, 2013.*

They are also advised to look for other ways and means of surviving and so they will switch to other alternative resources as they are very much aware of the alternatives that exist. These methods work to conserve and reverse the depletion. In some places, as the transect walks and observations revealed, the degradation is so bad that natural replenishment is either difficult or will take too long. To address these issues the community has resorted to the replanting of the mangroves in the forests and the creation of traditional fish ponds to allow the fisheries in the ocean to replenish.

The community also encourages individuals to throw the remains of fish and other marine animals into the sea for the regeneration of the corals. This is because the relationship between natural resources and culture forms the pillar of resources management in the community. This is manifested in the perception of the natural world and the resources

found in it as sacred. References made to resources as belonging to *Mulungu* (the Supreme Being) is a case in point.

We can also acknowledge that the series of taboos and prohibitions regarding the extraction of resources as well as the designation of some resources and spaces as taboo areas inevitably facilitate the management of resources through norms and values that are embedded with ethical considerations. Taboos and prohibitions may be looked at as superficial superstitions among the Giriama. A close scrutiny reveals a causal relationship between the taboos and maintenance of the resources' health that leads to conservation.

The local community has deep knowledge of the functioning of the mangrove ecosystem. It is also aware that the presence of fish, crabs and molluscs in the creek and adjacent lagoons is directly linked to the health of the mangrove ecosystem. This awareness has also led the communities to become involved in mangrove conservation initiatives, managed by the communities themselves. There was evidence of this community-led regeneration activities in Kanamai (Plate 6.6).

CHAPTER SEVEN
DISCUSSION OF FINDINGS

7.1 Introduction

In this chapter, the study findings are discussed. The discussion draws from other studies in the area of indigenous knowledge and the management of natural resources in general and marine resources in particular. It follows a thematic sequence and is based on the research questions and study objectives, which are then linked to the assumptions and the theory that guided the study.

7.2 The natural world in Giriama cosmology

The Giriama, like many indigenous communities, have evolved different notions of the natural world in ways that suit them and their particular context. The implication is that they have developed a strong tradition of environmental knowledge in regard to the marine resources and ecosystems. This is evident in their beliefs, perceptions and attitudes, which are in part shaped by their values, worldview, and environmental ethics. Among the Giriama, cosmology and indigenous belief systems are the very foundations of this epistemological evolution. This means that the exploration of environmental ethics and culture in this community can be seen through the nature and significance of indigenous knowledge. This knowledge is rich, diverse and vibrant. The knowledge is utilised by the community to adapt to their physical environment, biologically as well as ritually.

The theory which guided this study is premised on the idea that culture is the most important concept in anthropology. Which means that as an anthropological study, the keen interest was to relate ecological survival to cultural institutions that pursue livelihoods. At the same time, as Harries-Jones (1992:159) points out, it must be borne in the mind that ‘ecological survival’ is a large scope of inquiry and our major ecological concern is to define and explain all means of conserving life’s margins. For the purpose of this study, culture is the focus of the analysis in the relationship between humans and nature. Ecological survival, through indigenous knowledge of the biosphere is, therefore, a cultural concept.

Therefore, this study recognises that the environment for the Giriama is much more than a set of material possibilities to which their culture, social organisation and kinship system has adapted. In the process it becomes apparent from the Giriama experience that the structure of the biosphere is such that it is comparable to a very large communication system respective to the fitness of its integrated cycles to the functions it serves. There is referencing up and down, a hierarchy, which can be glimpsed into alternatively as variations or patterns**.** From there, to understand the non-linear characteristic of natural ecosystems such as mangroves, fisheries and corals, we can then build this understanding into an ecological epistemology (Bateson and Bateson, 2004:12). In the process, the relationship between nature and culture, through indigenous knowledge, becomes that of a structural system.

Knowledge provides people with materials for reflection and premises for action within culture. On its part, 'culture' too readily comes to embrace also those reflections and those actions. Thus, the concept of 'knowledge' situates its items in a particular and unequivocal way relative to events, actions, and social relationships (Barth, 2002:1). In other words, knowledge is distributed in populations whereas culture is understood in terms of sharing.

However, it is important to acknowledge that stocks of knowledge vary widely within populations depending on spatial, social and cohort experiences. In this context indigenous knowledge gives the Giriama individual the capacity to orient himself or herself with marine resources. Consequently, this knowledge structures the individual's understanding of the world and purposeful ways of acting. It guides interaction with marine resources, providing rules of extraction and utilisation. It lends itself to management efforts, leading to conservation.

Therefore, indigenous knowledge is a substantive corpus of assertions and ideas about the world. It is also a range of media of representation such as words, symbols and actions, which makes it an aspect of a structural social organisation. Then, as an aspect of social organisation, knowledge is distributed, communicated, employed and transmitted within a series and layers of institutionalised social relations. In this way, indigenous knowledge can be represented as emerging from a complex structural system composed of three

subsystems: context, practice and belief. Thus, indigenous knowledge as contextual knowledge is based on history, demographic factors and biophysical features of place.

A number of anthropologists have found the same connection between knowledge of the marine environment and the complex of context, belief and practice in other areas inhabited by indigenous communities. Malm (2009), for instance, found that in Tonga, what one sees depends on what one knows. And what one knows is a function of how one was socialised to know. That is why the landscape has had two meanings in anthropological discourse. One meaning refers to the one that the anthropologists initially see, that is, the "objective" landscape inhabited by the people in this area.

Then there is the landscape they come to recognise and understand over time through fieldwork. This is the meaning of landscape that anthropologists should pay attention to, since it is the landscape that is produced through local practices and thus has emerged as a cultural process. This cultural process is historical and contextual. For instance, over the millennia, the people of Oceania have gained deep insights based on interpretations made in connecting life with the ever-present nature, insights that have been passed on from generation to generation and modified through new experiences. Their terminologies connected to coastal and marine features are excellent examples (Malm, 2009).

Back to the Giriama, the concept of the environment is understood in many ways. This is demonstrated in the community's representation of space and what it comprises. Overtime, just like the people of Oceania, they have been able to adapt through the adoption of various solutions from a number of alternatives.

Thus, indigenous ecological knowledge in this community is varied and rich. We may find this in the retinue of taboos and prohibitions that, inadvertently, though deliberately conserve resources. Evidence for this may also be found in their taxonomical naming of various phenomena existent in the environment. This may be so because the Giriama depend a lot on the environment, which makes them pay great attention to it.

This dependence on the marine resources highlights the relationship between an indigenous community's perception of the physical characteristics of the environment and

the social production of knowledge. Thus, the lack of a particular word in the local language that denotes environment does not imply that the community cannot perceive and categorise the environment. In fact, different aspects of the natural world are aptly and elaborately differentiated and named by the community. This is evident in the way different mangrove and fish species are named and categorised according to location, characteristics and use. The vast ocean is also categorised according to utilitarian as well as ritual and symbolic significance. This ties in with the work of Andersen *et al.* (2004) who did their study on the traditional ecological knowledge among the Eskimo people of Alaska in regard to subsistence harvest of non-Salmon fish in the Koyukuk River Drainage.

The environment, as some respondents pointed out, provides human beings with food, air and shelter. This is why differentiating between the human and natural world is a problem for them. For the Giriama, humans are so intertwined with the natural world that separating the two is akin to severing the link between unborn children with the mother by cutting the umbilical cord. This implies that environmental protection is something they have always taken seriously. It is not only part of the cosmology among the elders, it is firmly internalised during the socialisation process. This may be the reason the Giriama compare pollution of the sea with relieving oneself in the granary where one has kept the family food. For them, this is the highest form of impropriety that would attract the wrath of the ancestors, apart from just being bad manners.

Knowledge of the larger ecosystem which provides habitat for valued marine species includes the broad physical and biological features, the deep sea itself, the tidal zone surrounding the research site, the shallow areas of the sea, and the outer border of the atoll where it drops off into the ocean depths. These are the features that the community have identified when looking out to sea from above the land. According to the respondents, humans do not experience the environment as a "blank slate" in the ordinary course of life, a space simply awaiting the imposition of cultural order. Instead, in the course of their daily activities, people acquire intimate knowledge of the environment, and discover meaningful objects (Cordell, 1991).

A number of studies such as those of Fraser *et al.* (2006), Diegues (2001), Cunha (1997) and Silva (1997), have brought to the fore the cultural perception of the relationship between land and sea space. These studies highlight the perception indigenous people have of the relationship between physical characteristics of the environment and the social production of knowledge. According to Cunha (1997), fishing knowledge is culturally produced and accumulated through professional practice and continually recreated according to the features of the maritime environment which presents itself as cyclic, mobile, and unpredictable. In other words, the appropriation of the sea and its resources is expressed in the principle and practice of "knowing-how" and marine territory is constructed and ritualised by means of tradition, apprenticeship, experience, and intuition. This know-how is only attainable by those with experience and intuitiveness that comes from understanding what tradition is in specific cultural and work/production contexts of fishing apprenticeships.

Therefore, like many indigenous communities, the Giriama have the ecological knowledge and technology which facilitate their adaptation to the physical environment, particularly the marine ecosystem. Since the Giriama people depend a lot on their environment in general and the marine ecosystem in particular, their culture has evolved ways of managing the fragile marine ecosystem because it is a major source of their livelihoods. This is shown in the various solutions they have adopted from a number of alternatives, and which form the basis of indigenous knowledge. The very concept of the environment is understood by the community in many ways. The community's representation of space and what it comprises is evident in their ethno-taxonomical naming of various environmental phenomena. When analysed deeply, their knowledge is significant in shaping an ecologically sustainable society.

Accordingly, among the Giriama, like in other indigenous communities, the relationship between combined land and sea space denotes the meaning of time, space and distance about where fishermen and mangrove cutters live and do their work. It is from this perspective that we may understand why the Giriama cosmology perceives the environment and nature as consisting of two vast worlds: sea and land. For them, distinctions between these two worlds are an important basis for classification, since animals and plants are understood and organised according to the fact that they belong to

one or the other domain. In this schema, those species operand on land are seen in a relationship of contiguity with fishermen and classified according to certain human characteristics.

On the other hand, the marine species are linked to land by analogical relationships, the marine world being perceived as an imitation of land reinforced by the similarity of forms between the beings of these two "worlds". The human world is socially and biologically tied to these two worlds. This facilitates recognising the difference between land and the sea and the relationship between the two geographical realms in kinship metaphors.

Something else that comes to the fore from the findings regarding traditional knowledge in regard to Giriama cosmology, is that it is used in establishing social boundaries, by rights, to define who has access *rights* to a given area. This knowledge is based on long-term empirical local observation of the biosphere and is the basis of indigenous knowledge as context. It is adapted specifically to local conditions, embraces local variations, and is extremely detailed. This is evident in the naming of different species, with details about their physical and behavioural traits. It is also practical and behaviour-oriented and focuses on important resource types and species.

The shore, including land exposed at low tide, the nearest area and coastal cliffs, is directly connected to human activities in the marine environment. This is where people watch for changes in the tide, look for empty shells or crabs while foraging among the mangroves, sit down to relax in the breeze (eating some of their catch), and where canoes and other boats are kept. This is also the zone where reef limestone, a white or pale-yellow lumpy mixture made up of coral, shell and algal rock, with calcite crystals as a binding material, is quarried for construction works many years ago, and is still collected for use in earth ovens.

It can be also observed that indigenous knowledge is structured, which makes it somewhat compatible with Western biological and ecological concepts through a clear awareness of ecological links and notions of resource conservation. Like the culture it is based on, indigenous knowledge is a dynamic system capable of incorporating awareness of ecological perturbations or other changes, and of merging this awareness with a local

core of knowledge. In the neo-structural perspective, the indigenous knowledge of the Giriama can then be represented as emerging from a complex structural system composed of three subsystems: context, practice and belief.

From the findings it can be inferred that the indigenous knowledge in this community is based on practical observation and experimentation. This practical knowledge is a function of history, demographic factors and biophysical features of place, and depicts meaningful action, through physical interaction and experiential learning. Therefore, the ritual behaviour of a community also forms part of the perception and knowledge repertoire. This is the neo-structural aspect of knowledge as belief. For instance, activities are scheduled to indicate the start and end of the fishing season as well as entry into the mangrove forests. These include the rituals and taboos observed in regard to the sea, mangroves and corals. A case in point is the elaborate ceremony consisting of many rituals performed at the beginning of the fishing season or upon entry into the mangrove forest. The ritual is complete with a specific place in the sea (*kitwani*) where rituals are performed to make the season successful.

The fact that the place is chosen through tradition and the reason it is chosen is unknown is indicative of the ritual importance of fishing in the community. It is notable that a number of rituals are performed with prayers and libations are poured into the sea to appease the gods and ancestors in anticipation of a successful fishing season ahead. The meal prepared in this place and the prayers are an indication of how the community highly regards the profession of fishing and the fish resources themselves. Another illustration is the confirmation of the prayers, which is paramount to the success of the season.

The specific area in the sea where rituals take place points to the indigenous geographical information systems (GIS). This implies a connection between physical and ritual space through indigenous GIS. It can then be inferred that indigenous peoples have also used their knowledge to represent the spatial dimension of important geographic features on the landscape and seascape. For thousands of years mental, physical or oral maps have been used for defining boundaries of sacred and secular spaces on land and sea. This has

then been used for depicting the location of important resource zones and sacred sites. These maps may be owned by an individual, family or lineage.

According to Maldonado (1997), the ability to identify particular zones of the sea and to find one's bearings in the midst of the immensity of the sea, out of sight of land, is part of what he refers to as "the cognitive skill set of fishermen". This ability seems to be the direct and accumulative result of continuous interaction between many fishermen communities and the marine environment. In a related study, Wavey (1993:13) found that elders in Manitoba, Canada, teach skills and maintain continuity and links to community resource areas by transferring highly detailed 'oral maps' and inventories of resource values and land use to their younger members.

These individual and family maps also complement one another in such a way that they provide an integrated knowledge of the ecosystems within the village's traditional resource area. In another study of mapping customary land in East Kalimantan, Indonesia, Sirait *et al.* (1994) found that the combined use of oral histories, sketch maps, and GIS and the Global Positioning System (GPS), could be instrumental in mapping customary land tenure and comparing villagers' perceptions of land ownership and land use to those of the state. This is the basis of cognitive and oral maps. This has also been demonstrated by Awori *et al.* (1996) as well as Alexander and van Djik (1996).

The cognitive and oral maps presented by Giriama people may be seen in the same way. These maps are, in other words, an indigenous ethnographic model of the Giriama cultural code. The maps also reflect social behaviour and aspects of marine resource use and conservation. If we consider the choice of the place called *kitwani*, the ritualistic and sacred nature of the location points to a coterie of observances which, from a superficial viewpoint, could just be another superstitious ceremony undertaken every year. From an anthropological and analytical perspective, this place and the ceremonies that take place there are part and parcel of the wider cultural picture of the marine resources. We can tell who is allowed to participate in the ceremonies. The ceremonies also point to the beginning of the fishing season.

Prior to the ceremonies, no fishing is allowed in the sea by series of taboos and prohibitions. However, as Mzee Mfuko and Bakari pointed out, the taboos are a sure method of making people respect the replenishing abilities of the sea. If decreed in plain language, many curious individuals are likely to flout the rules of conservation. The elders are aware that many fish species spawn during the period when the period of inter-seasonal rest for the fishers. Thus, these prohibitions and taboos are used to mask the natural cycle of replenishment. As Gachihi (2012) found out in her study about the ritual importance of the kaya forests, the description of the rituals at *kitwani* reveals symbolism of death and rebirth, depletion and regeneration as well as pollution and purification. The ceremony is a revelation of the death of the old fishing season and the birth of the new season. One other thing that emerges from this ritual is the admission of human limits. The fishers acknowledge that much as they are the leaders in the community on maritime knowledge, they cannot possibly know or control everything about the sea and fisheries.

It is notable that the rituals which take place in the sea or sacred mangroves are for the maintenance, renewal and replenishment of the resources as well as for the health of the whole universe as a whole. The rituals are also meant to cause harm or even death to those who disobey the rules of resources use. For instance, those who enter the sacred mangroves or restricted fishing areas without permission have been lost without trace, while those who use routes other than the designated ones are killed by thunder or some other freak accident.

The findings can then be explained from the perspective of neo-structuralism which, as a theory, is concerned with grasping the unconscious structures underlying each institution, tradition, norm, value and custom within a culture (Kuper, 2006:85). Therefore, within the purview of neo-structuralism, the Giriama cognitive maps are part of the cultural institutions which provide building blocks for the understanding of the whole. They form part of the layers that provide structural interconnections between indigenous knowledge and resource utilisation.

This means that oral and cognitive maps, together with resource maps, have a bearing on or derive one from other facets of Giriama culture such as taboos, prohibitions, naming system, marriage arrangements, political organisation and naming system (Kuper,

2006:82). Indigenous knowledge on marine resources is, therefore, not an isolated domain. It must be linked to the economic and political structures. In this case, we may refer to the process of knowledge acquisition or ascension to the leadership of a fishing expedition. These structures are based on the relationship between material conditions on social relations in the community.

The theory also helped us to conceptualize the way in which the cognitive maps reflect the worldview of how the land and seascapes are organised and how the marine resources should be utilised. To make sense out of the natural world, the community employs lexical categories for identifying eco-zones that reflect their intimate connection with the marine resources (Bryant, 2013). Kinship metaphors are used to demonstrate their strong connection to the natural environment and this is often based on a strong spiritual connection with their ancestors and the land where their ancestors are buried as well as on subsistence needs. Naming of fish species are a case in point, *kiboma* and *mwenza mawe* are an illustration of this metaphorical use of kinship terms to refer to environmental cues. Another example is where mangroves are treated as kin, in the case where unnecessary extraction amounts to hurting the kinship relations with them. But the community elders and leaders are keen to take that relationship to the ancestors as the protectors.

This brings out the extent to which we can use neo-structuralism as an analytical tool for explaining the solidarity between different cultural traits (Bryant, 2013). Indigenous knowledge must be practically, contextually and ritually related to other facets of culture to bring about structural solidarity and harmony. In essence, the nature and extent of the way the environment is exploited is dependent on the way natural resources are tied to other aspects of the cultural behaviour of the community operand in that environment (Kuper, 2006; Ruddle, 1994).

The study findings suggest that indigenous knowledge is structured along gerontological lines. This means that indigenous marine resource knowledge is not evenly distributed among community members. Knowledge varies among communities and among their members according to age. This is also reflected in studies done by other anthropologists. For instance, Diegues (2001), in his study of Brazilian fishers in the northeast, found that although old male fishermen are generally considered to possess more knowledge than

their younger counterparts, successful captains are not necessarily the oldest fishermen. Rather they tend to be people with natural leadership and captaincy qualities.

Among Diegues' (2001) research subjects, the natural ability to command is locally referred to as *mestrança*. In the same community, knowledge which is associated with captainship requires competence and experience that bestows authority to orchestrate fishing operations, based on respect (*respeito*). The respect is gained from the crew members. Diegues goes on to demonstrate that some captains are boat owners themselves but many of them work on other people's boats. For the fishermen of Galinhos (Rio Grande do Norte), Diegues (2001) observes that finding fishing spots is certainly not just a matter of luck. Captains must be competent to sail at night guided by the stars in order to locate the best and most productive fishing grounds, which they hold secret. Women too are skilled in locating and sustainably using shell fish beds to provide food for households when boats cannot go to the sea due to bad weather. In some regions of Brazil some women go fishing with their families (Diegues, 2001:11).

Thus, indigenous knowledge becomes a function of time and space. It is derived from detailed and long-term observations of the physical environment based on social reality and presented in linguistic metaphors. This emerges from the findings in the sense that interaction with particular resources aligns one with profound knowledge about the particular resource. Thus, this knowledge is contingent upon age, gender and the length of time one has interacted with the resources. It can, therefore, be deduced that indigenous knowledge on marine resources among the Giriama is not evenly distributed in the community. That may explain why old fishers and mangrove cutters generally possess more knowledge than their younger counterparts. It also explains why some people have profound knowledge on some of the resources compared to others. These findings are in agreement with Diegues' findings.

Just as Diegues (2001) found among the Brazilian fishers, age and the time taken to interact with the resources alone are not sufficient in regard to the amount of indigenous knowledge about the resources. Other factors come into play. These include keen apprenticeship skills and a knack for leadership and acute ecological awareness. The

fishers in this study reported that successful captains are not necessarily the oldest fishermen, but rather people with natural leadership and captaincy qualities.

As the respondents intimated, the ability to command counts for those who lead the fishing expeditions. Besides, they must be individuals with impeccable character, people to be relied upon. This respect must be earned from crew members on one's boat as well other boats in case the expedition is composed of more than one fishing boat. Ownership of a boat may also determine ascension to leadership, although this has to be accompanied by acute knowledge of the sea and possession of leadership skills combined by the ability to inspire respect.

In addition, indigenous knowledge is also gendered. This is because men and women usually have distinct economic resource bases and social constraints. There are several types of gender differences in local knowledge systems. Men know more about the mangrove species used for construction and timber while women know more about those species used for firewood. We can also make reference to knowledge about the marine ecosystem as a function of the aspect of resources one is interested in. The local people we interviewed had different occupations in regard to the marine resources. In this regard the findings bring out indigenous occupations such as healing, mangrove cutting, building and fishing. In this community, ecological knowledge about mangroves, corals and fisheries could be understood as a distinct cognitive realm.

Both men and women know about the species used for medicinal purposes. However, those who have knowledge about the medicinal plants are those trained in the art and science of healing in the community. Healing is a sacred calling which is practised mainly by women. These women know a lot about mangrove species that have medicinal value. For them, the mangroves are an essential component of the healing practice since they are a source of herbs, leaves and roots. Their training is tied to elaborate knowledge of the mangrove ecology. They must possess knowledge about the germination behaviour, growth patterns and spatial distribution of the species. This is because if the spirits require a healer to go and fetch herbs or roots from the forest, it must be from a particular tree and that should be done as commanded.

From one perspective, indigenous knowledge in this community is about a replicable, orally transmitted set of specialised skills and culturally shared practices and beliefs that have stood the test of time. This is especially so as regards knowledge about mangroves and fisheries. And that is why those who cut mangroves are also well-versed in the information and knowledge of the species and their characteristics. They know much about the distribution and characteristics of the different species in the area.

On the other hand, those who deal with fisheries have internalised the names and behavioural patterns of fish species and this makes it possible to know when and where to catch certain fish species. For instance, the *dagaa* and *simsim* are known to be highly migratory. According to the respondents, these species migrate with the winds. Thus, fishers must be very observant and alert regarding weather changes. These observations provide us with insights into the meteorological expertise of the community. It is noteworthy that fishing is an occupation undertaken as a family, clan or lineage profession. This means that knowledge about fish behaviour is kept within these confines of the community. However, this information is also available to those who wish to join fishing as a profession.

Another interesting aspect of this knowledge concerns some terrestrial animals that feed on certain fish species. This is the construction of food chains which then provide insights into another aspect of the marine ecology, ethno-ornithology. Members of this community have observed the feeding behaviour of animals around the sea and identified the birds which can help them in case of need. The *dagaa* and *simsim* are small and cannot be seen easily. As the findings indicate, they are fed on by three birds, namely, *nyange nyange*, *membe* and *shake.* The implication is that the fishers must be vigilant when the three birds swirl around a given area in the sea. Practically, then the three birds, in the final analysis, form part of the ecological kinship between the fishers and their livelihoods in the sea.

In this way we can see which items of the marine environment are ritually important and which ones are aesthetically important to the community. Through this classification, we can deduce that the Giriama, like many other indigenous communities, do not recognise the boundaries between the human and non-human world. However, they are also aware

of the contiguous borders between clusters and types of resources. This is how the respondents explain the different species of the marine resources and their uses. It is in this way that poisonous and non-poisonous resources are classified by the community and assigned their appropriate positions in nature and society. This awareness forms the basis of indigenous taxonomy and nomenclature.

For instance, the mangroves are generally referred to as *mikoko*, which is the local name for the most widespread and common of the mangrove species, namely, *Rhizophora mucronata*. The mangrove forests are highly valued in the community. The knowledge of the relationship between the mangroves, corals and the sea was ably demonstrated by the study subjects. At the same time, the durability and utility of the mangrove trees was also acknowledged. This knowledge, however, is stratified along the continua of gender, age and profession.

The classification also denotes the spiritual and ritual aspects of indigenous knowledge. Some resources are regarded as sacred or property of the spirits. Indeed, all the resources are considered the property of the Supreme Being, locally referred to as *Mulungu* (The Creator). However, some resources are particularly deified and considered the property of ancestors. This is typical of particular medicinal plants in the mangrove ecosystem or whole mangrove forests, creeks and coral reefs. It is in this respect that species such as *mchu* are considered the house of sea spirits and so taken care of meticulously by herbal healers.

These findings are in tandem with what Oso (2007) found among the Yoruba of Nigeria. In this community, there are villages which specialise in producing herbal medicine. While they plant some of the herbs used in healing, some of them grow naturally. The relationship between the Yoruba and the Giriama in this case is the transmission of the indigenous knowledge about natural resources as well as the linking of the resources to the supernatural. Among the Yoruba, plants are part of the broad aspect of life; they maintain their personality, individuality and psychic space. Each plant has its own aura, surrounding magnetic field and relates to the universal energy in terms of consciousness. This is the link between the human and natural world, the wholeness that indigenous

people refer to when linking the human and natural worlds. This knowledge is transmitted to herbal healers through spiritual visitations, visions or trances.

The study findings also indicate the profound knowledge the community has accumulated in empirical meteorology, especially the behaviour of the sea. The Giriama community has internalised the weather changes that influence the behaviour of the sea, including tidal schedules. This knowledge regulates activities in the mangrove forests as well as the sea. Thus, fishers and mangrove cutters work according to this timetable. Those going into the sea or mangroves must take note of the schedules and seasonal changes. In case of changes, they have to wait for three days to a week before the new tidal schedule normalizes and the sea settles down to welcome them back. This knowledge has enabled the community to know how climatic factors affect their interaction with the marine resources. Thus, the findings suggest that community members are aware of the climatic and meteorological factors that affect resources utilisation and regeneration.

This is a very important aspect of indigenous ecological knowledge. Their practical and long-term observations have yielded invaluable knowledge on rainfall, wind and temperature patterns and their effects on mangroves, fisheries and corals. For instance, they reported that during the rainy season, fisheries migrate from the deep sea to the shores (for cool temperatures). This means that meteorological knowledge not only affects activities in the mangrove forests and sea but also has an effect on species distribution. Thus, fish distribution is a function of the temperature of the sea water, which also depends on the season.

This explains why fishing is undertaken during the dry season, which is the season with plenty of fisheries in the sea. The reason is that fisheries prefer cool temperatures. Usually, high temperatures affect species distribution and migration in the sea. This is because high temperatures bring most fish to the shore. Temperature also affects fisheries resources and their regeneration. However, the major weather element that affects the resources and their regeneration is sunshine. Fisheries breed normally during the cool weather or season where there is moderate sunshine for the survival of the small fish.

Weather elements also affect the regeneration of mangroves. During the cool season when there is limited sunshine, the ground on which the mangroves grow is very soft and wet. Some mangroves shed their fruits; these fruits are very sharp and fall down with the sharp end facing down. Therefore, their fruits can easily penetrate the ground and give their seeds the chance to germinate easily. According to the respondents, these conditions are very good for the propagation and reproduction of the mangroves.

Mangroves need a given level of salinity to survive. This is provided by the ocean water which may not be the case with inland waters. They need tides rather than stagnant water which instead would choke them. Mangroves thrive in the self-exchanging system of sea and fresh water. They thrive well in a muddy and generally soft substrate though many species may grow on the hard substrate. Mangroves are found in the sea and also on land. Some are fully covered by water while others are partly in water and partly on land. The defining factor is the salinity of the waters, meaning that different mangrove species survive in different saline water conditions.

At the same time, the nature of soils also counts, as different soils support different mangrove species. Thus, mangroves grow in conditions that provide their nutrient needs. In his study in Msambweni, Kwale County of south coastal Kenya, Shilabukha (2000) found similar ideas among Digo community regarding mangroves. This is probably because the Digo are also a Mijikenda community.

Community members are also aware of how mangroves are affected by temperature and the seasonality of wind. Temperature and the amount of water affects the growth of mangroves which, in turn, affects the marine animals found there. Strength of the wind also affects the mangroves. For example, heavy winds break the branches of the mangroves which can slow down regeneration and expose the fish species that hide under the mangroves to unfavourable light. On the other hand, high temperatures encourage evaporation to take place and this exposes the breathing room of the mangroves.

Wind patterns, especially wind direction, influence fish species distribution and migration behaviours. The wind patterns are affected by annual seasons and daily weather patterns. There are two seasons, which are the wet and dry seasons. Species availability and catch

vary according to season. Some species appear during the wet season, others during the dry season and others are all-weather. Generally, the catch is very high during the dry period. This is the time when the sea is calm for both the fishes as well as the fishers.

Wind direction helps fish to locate their food and enemies and so contributes to species distribution, behaviour and migration. Furthermore, wind direction enhances species security. Due to these factors, the community has observed and internalised a meteorological sequence that they do follow, as this means that there is an influence on the use of the resources. This is because knowledge about fisheries is utilised in regard to the sequence of the seasons.

Clouds also offer clues for interaction with marine resources. In monitoring the clouds, the community looks at the concentration of the clouds in the sky. It is very important to monitor the cloud concentration as this influences the prospects of catching fish. For instance, heavy clouds cover known as *kolowa* leads to the presence of many fish, which then means positive prospects for fishers. However, there are some fish species that follow the cloudy conditions, for example, *simsim*. The behaviour of these fish has been observed for long and community members know that much as these are a delicacy, they are also dangerous to follow. It requires expert fishers who know the sea maps to follow and catch them. The maps are dictated by the direction and strength of the winds. These then dictate the path followed by water and that followed by humans.

This ecological knowledge regulates fishing, and may actually explain why fishing is not undertaken all year round. It is seasonal. For the Giriama the dry season begins in October and ends in April. This means that the annual changes in climatic conditions are also a factor to consider when undertaking activities in the sea or mangrove forests. The direction of the wind heralds the seasonal changes and fishers have internalised these conditions. The south to north winds herald the beginning of the dry season, *kusi*. Most fish species swim along with these winds. When the winds change direction, the sea begins to change colour and becomes rough. The fishers know it is dangerous to go into the sea with the rough and high waves. This carries the message of the beginning of the wet season and therefore no fishing is undertaken.

A number of anthropological studies such as Wagner and da Silva (2014), Acheson (2003), Bateson and Bateson (2004), Costello *et al.* (2009), Drew (2005) and Mallory *et al.* (2003) have demonstrated that indigenous knowledge is used in forecasting weather and seasonal changes. These studies have identified and documented evidence which reveals that communities rightly observe changes in their climate and have substantial understanding of what goes on around them and how they should make adjustments to ensure their livelihoods go on. The communities are able to provide concrete evidence of the observed changes to buttress their observation.

Indigenous meteorological knowledge has also been noted by anthropologists regarding plant and animal behaviour which responds to changes in the weather. Among the Tallensi of Ghana mammals, birds, worms and even reptiles have been observed to provide clues on changing weather and seasons in a given year (Gyampoh and Asante, 2011:52). For instance, the movement of a certain bird which looks like a duck or cattle egret, locally called *haahor*, is an indicator of seasonal changes. When this bird moves from the south to the north, making its sound "*Kwaaa kwaaakwaa"*, this is an indication that there will be plenty of rainfall. When the bird flies to the south, this is an indication of less rain. Additionally, Gyampoh and Asante (2011:24) found that when a species of an old frog, locally referred to as *yakase*, are heard in May to June, it is an indication of the rainy season approaching. Their sound is said to call the rains so when they are heard together at a certain time of the year, it means it is time for the rains. The frogs are usually heard in June or July (Gyampoh and Asante, 2011:43).

In the same community, it was reported that a tree known as *kakapenpen* or *nkudua* is another indicator of change in weather or season. When this tree bears fruit and ripens, then the rainy season is near. According to the findings of Gyampoh and Asante (2011:24), the Tallensi also use the behaviour of invertebrates to predict weather changes. For instance, when millipedes and centipedes are observed climbing to higher grounds when the rainy season begins in July, it is an indication that the community will experience flooding. So they begin to build traditional dykes and canals to guide the water from the rain so as to alleviate the impact of the flooding in the community. The Tallensi also use temperature to predict weather conditions (Gyampoh and Asante, 2011). Accordingly, when the dry season from November to February is very intense, then the

rainy season will be good. If this season is not very intense, the rains will be low, an indicator of poor harvests.

From the neo-structuralist framework, we can suggest that Giriama meteorological knowledge is part of the fusing of the physical with the cultural. Indigenous knowledge about seasonal and weather changes reflect the fact that the Giriama are thoroughly acquainted with the biology, physics, and geography of their environment. This knowledge is also a reflection of knowledge involving process and self-organisation, making indigenous knowledge a guiding metaphor. Thus, indigenous meteorology should be treated as the master science of ecological survival for the community.

In this way, knowledge about seasonal wind direction and the attendant conditions in the sea regulates fishing and helps to conserve species by allowing natural replenishment. However, it is not only the knowledge of the natural behaviour of the elements that has come out of the findings. As Ruddle (2000:282) points out, "resource use patterns among indigenous communities are products, not of the physical environment and its resources per se, but of their perceptions of the culturally formed images of the environment and its resources". Thus, to properly understand human ecological relationships, it is crucial to get a firm understanding of a society's indigenous knowledge base, and the cognitive system underlying it.

The reason is that there appears to be a significant gap in comprehension between two different worldviews, one "scientific" and the other "cultural". To close this chasm, we need what Hornborg (1994:251) refers to as a 'conceptual symbiosis' to occur among all the players involved in natural resources management. This will lead to a new and more complete understanding of indigenous ecological knowledge in its specific context of use in regard to natural resources management. For this to occur, we need to put in place a different conceptual framework which will take cognizance of indigenous ecological knowledge. This framework must be one that will go beyond the imposition of one worldview upon another and which, instead, will integrate epistemological differences of scientific approach to natural resources management and indigenous approaches.

Thus, the present study postulates that there is a relationship between the presence and use of indigenous knowledge and the suitable use and management of the marine resource among many people around the world. The study avers that recognition of indigenous management systems is important because these systems are based on alternative collective wisdom. This collective wisdom is based on local ecological knowledge which has become refined and so it should be allowed space in policy documents and research agenda since its influence can no longer be ignored.

From the findings, we can see that the Giriama community, through its indigenous ecological knowledge, monitors the climatic conditions that affect the resources and their use. These climatic conditions are monitored in various ways. For instance, in monitoring rainfall, the community checks for signs and indicators. For example, when corals become shiny, this is a sign that that heavy rainfall is on the way. Then there is shedding of leaves by the mangroves and the appearance of certain fish species. This is also an indicator of heavy rain on the way. These signs also have implications for prospects of catching fish and working in the mangrove forests. Changing of colour by the sea water and turbulence is another indicator that there are changes on the way. This again has implications for working in the sea and mangroves. If one ignores these signs one ends up drowning if the turbulence turns into massive and high speed waves.

For the Giriama, indigenous knowledge about natural resources generally and marine resources in particular, combined with the regulations that are in place for the management of the resource depict a complex picture of the meeting of culture and nature. The implication is that natural resources do not just belong in the realm of the natural world. Rather, natural resources are connected to the human world through language, ritual, taboo and kinship ties. In a nutshell, the sacredness with which human social relations are treated is extended to the use of natural resources. Nature is sacred; therefore, humans respect and worship the natural and nature is taken to be part and parcel of their kinship and friendship ecosystem.

These findings bring out the contextual, relational and experiential nature of indigenous knowledge among the Giriama and other indigenous communities. Indigenous ecological knowledge is based on a worldview and culture that respects wholeness, community and

harmony which are deeply embedded in cultural values. Among indigenous peoples, therefore, a person becomes human only in the midst of others and seeks both individual and collective harmony as the primary task in the process of becoming a true person.

The collectiveness and harmony also includes harmony with nature. At the same time acquisition of knowledge is collective and community-oriented. Central to this worldview is the strong orientation to collective values and harmony rooted in a collective sense of responsibility to nature and community. Thus, indigenous knowledge and its method of acquisition, has a practical, collective and social or interpersonal slant. This may explain why indigenous conceptions of time, space, nature and resources emphasize the practical, interpersonal and social domains of functioning and they are quite differentiated from the cognitive 'academic' intelligence that dominates Western concepts of the construct.

7.3 indigenous Nomenclature

One of the enduring debates in anthropology in regard to natural resources is the classification of the natural world. There are those who espouse the view that we have a human world which is distinct form the natural world. On the other hand, there are those who contend that the reference to the human and natural worlds and their distinction is a creation of the Victorian, industrial and urban cosmology. This negates what many indigenous communities believe in as far as natural resources are concerned (Harries-Jones, 1992:160). Neo-structuralism, as a theoretical framework, is concerned with grasping the unconscious structures underlying each institution, tradition, norm, value and custom within a culture (Kuper, 2006:85). Therefore, cultural institutions provide building blocks for the understanding of the whole. These layers have structural interconnections. This means that naming and classification of the universe, for instance, has a bearing on or derives from the importance with which the named and classified phenomena are held within the culture (Kuper, 2006:82).

In mapping the theory to the variables of the study, we may expand this proposition by postulating that structures intervene at strategic points in the interwoven strands of knowledge and culture (Derrida, 1992:114; Husserl, 1989:18; Rorty, 1989:6). Structure in this sense is about an abstract model of objects, experiences or events such as names and

features of environmental resources that get inscribed in the consciousness including elements and the law of their classification and composition.

Therefore, the structural schemata of the knowledge of resources and their features are adduced as hypotheses that allow anthropologists to explain the diversity of human practices and beliefs. In this way, empirical diversity is subsumed under an epistemic totalisation provided by structures that fall under the category of universal constituents of the human mind and stabilising themselves between nature and culture. For that matter, indigenous nomenclature and taxonomy constitutes one structure that leads to other structures, and vice versa. In this way we can present society as being constructed of like and unlike segments. These segments must be integrated to create mechanical or organic solidarity. This conceptual solidarity may best be achieved by setting up a structure of reciprocity. This is a system of exchange that binds the segments in the alliances (Kuper, 2006:76; Hiepko, 2006).

This, then, brings us to the relationship between humans and the natural world in regard to classification and naming, the basis of nomenclature. In anthropology, nomenclature is a system of names or terms for phenomena in a given culture. Nomenclature may also refer to the system of the rules of forming these terms. The principles of naming vary from the relatively informal conventions of everyday speech to the internationally-agreed principles, rules and recommendations that govern the formation and use of the specialist terms used in scientific and other disciplines (Willis, 1990:7).

Like many indigenous communities, the Giriama have an elaborate system of classification and nomenclature. This system is based on many years of observation and experimentation. From the nomenclature, we can see how indigenous systems name and classify species and sub-species. The Giriama community uses a number of criteria to classify the resources. For them all animal species found in the sea belong to the domain of *samaki* (fisheries). This is regardless of whether the animals are vertebrates or invertebrates. For the vertebrates, it does not matter whether they are crustaceans, reptiles, fishes or mammals. The basis of classification is the location of their normal habitat.

The findings indicate that the community is not only aware of the marine resources but also able to acutely demarcate the boundaries of the resources. This is reflected in the way they have classified the different features of the environment according to their uses and location. In regard to use, the Giriama classify resources and their aspects in terms of food and non-food items. Mangroves are classified not only in terms of type but also in regard to location and use. Cultural rules come into play here and these rules employ cognitive and oral maps to classify environmental phenomena. For instance, knowledge about the classification of mangroves is very detailed and this is easily verifiable from KMFRI, KWS and KFS scientists. In Kenya, there are about nine species while among the Giriama there are eight recognised species.

A close examination of the Giriama nomenclature reveals patterns that are based on experimentation and long-term observations about behaviour and physical appearance. The species are identified according to whether they are found in the mangroves, in the open sea or corals/coral reefs. These findings are in agreement with other research findings on indigenous knowledge and the biodiversity from elsewhere. For instance, it has been demonstrated that farmers can be excellent conservators of biodiversity. Richards (1985) found that small-scale farming systems in Sierra Leone, for example, are characterised by experimentation and observations on bio-diversity. For the Sierra Leonean indigenous farmers, biodiversity is valued for its own sake. Lamola (1992:3) and Hiepko (2006) have observed that small-scale farmers in developing countries breed local crop varieties for improved production using informal innovation systems based on indigenous knowledge. They often employ their own indigenous taxonomy, encourage introgression, select, hybridize, field test, record data and name their varieties. In Niger, a USAID-funded project identified a farmer-based agricultural research and extension system that parallels that of the national government (McCorkle and McClure, 1992).

In their agricultural research in Rwanda, Haugerud and Collinson (1991:5) found that farmers "recognise and classify several dozen different potato varieties, which they distinguish according to plant and tuber traits, as well as agronomic and culinary characteristics". At the same time, these farmers "recognise in maize, as in potato cultivars, important differences in taste, texture, storability, marketability, disease and pest resistance, and response to moisture stress. In the end the farmers have developed a

grid of reference for at least nine possible end uses, many of them simultaneously relevant on a single farm. This grid helps to determine the maize and potato genotypes the farmers prefer. The grid of reference is a function of age-old experiments and observations which include sight, smell, touch as well as taste.

The Rwandese, Sierra Leonean and Niger farmers, like Giriama people, classify species along the characteristics of what we may refer to as their "normal location", based on indigenous taxonomy. The implication here is that indigenous knowledge is neither haphazard nor unsystematic. Thus, investigating the nature of indigenous experiments and classifications that augment biodiversity could be of considerable use to national conservation and development programmes.

As Ruddle (2000) observes, the construction of this body of complex and detailed concepts and symbols is based on a long-term empirical observation and is applied to rather small marine areas used by local fisherman and seldom can be replicated elsewhere. For marine resources users, this knowledge also guides their behaviour and fishing strategies and is essential for predicting situations where marine activities such as fishing or mangrove cutting can be successful. In this sense, traditional knowledge helps indigenous communities to produce their own mental maps that indicates to them where and how to fish.

Apart from physical and behavioural patterns observed in the fish species, the Giriama community has isolated those species that are edible from those which are not edible on cultural as well as biological basis. There are species such as *bocho* (stone fish), *mkunga chui* (giant moray eel), *chale* (fire fish), *bunju miiba* (porcupine fish) and *jogoo nyeupe* (sea cucumber), which have poisonous properties and, therefore, from purely biological and practical considerations, they are classified as non-food items.

However, the ritual purity of items considered food or non-food also comes into play in the classification. In this way, the findings demonstrate that there are species of fish which are not considered edible for purely cultural rather than biological criteria. Then there are species which are used as bait only. In addition, there are species which are considered a bad omen or simply bad luck, meaning that catching them bodes ill luck for

the fisher. This demonstration brings to the fore the powerful role of culture in regulating human behaviour, including extraction of resources from the environment, nutrition and diet.

The classification of mangroves and their uses present another front in understanding the nature and structure of indigenous ecological knowledge in Giriama community. The community's knowledge of mangrove ecology demonstrates thousands of years of observation and knowledge transmission. Part of this knowledge revolves around species distribution and regeneration. Some mangrove species produce large numbers of seeds, while others produce fewer but relatively larger seeds by providing a large food store for their seeds before releasing them. The propagule (locally called *mlinga*) sometimes germinates while it is still attached to the tree or drops and floats on water until it lodges itself safely in the soil, hence the proverb, *mlinga dio mkoko* (a propagule is the mangrove tree).

The mangroves are an important natural resource for the Giriama community as they provide medicine, food, firewood and building materials for the community. At the same time, they serve other ecological purposes such as providing hiding and spawning conditions for marine and terrestrial animal species. Therefore, many materials are gathered from mangroves and continue to have high cultural significance, and many indigenous foods are still obtained from mangrove environments, including fish, crabs, oysters and vegetables. Certain mangrove plants are also used as food and medicines. Mangrove timber is also used to construct canoes, paddles and houses. Indigenous classification plays a very important role in this respect.

The experience from this study suggests that indigenous classification is based on the relationship between constant use and linguistic importance, which are tied to ritual significance. In Giriama culture, there are parallel classifications of the marine resources based on practical use and symbolic meaning. This agrees with the work Berlin (1992) did to develop an understanding of a basic framework for ethno-systematics. The present study, like Berlin's work, clearly demonstrates that within one culture there are likely to be parallel classifications and names for plants and animals, particularly the most useful ones.

Although cultures share gross partitioning of the plant kingdom, for example, trees, grass, ferns, etc., this begins to break down at the generic, species and sub-species levels. It is often not possible to create one-to-one correspondence between local and global (Latin or 'scientific') species names as one local name may refer to a genus or sub-species rather than a scientific species. That may explain why the general name for mangroves is *mkoko*, which is also the name of the most common and wide-spread of the species *Rhizophora mucronata.* Little of this thinking has trickled down into less specialised participatory techniques.

In this case we may infer that most ethno-botanical lists are prepared using a number of criteria. For instance, names are consistent within a community or language group and people will have a reliable name for species, which they use constantly. At the same time, species without a local use will not be reliably named. In the case of this study, the implication is that there is a one-to-one correspondence between Giriama and global names of marine species and indigenous experts can be used as key informants because they have greater knowledge of plants than other groups in society.

For many indigenous communities, indigenous knowledge informs decision-making about fundamental aspects of day-to-day life. This, in the final analysis, informs the way the community interacts with the natural world and how the resources in the environment have to be utilised. Thus, as Haugerud and Collinson (1991:6) have averred, sustainable conservation of the environment in all nations will require greater scientific respect for, and more effective collaboration with, those who possess the wisdom of generations of 'nonscientific' environmental knowledge.

Then there are taboos, prohibitions and proverbs which help in conservation of resources and encourage replenishment. For instance. It is taboo to eat young or small *kikorokoro* (threadfin butterfly), *kitatange* (crisscross butterfly fish) and *ng'ombe maji* (white-spotted boxfish). These are only caught for food when they are mature.

7.4 Sustainable management systems

Over the years, the management of marine resources has been changing. From the findings, the government of Kenya, through various pieces of legislation and institutional

mandate, has taken over the management of natural resources, including marine resources. KWS, KFS, KMFRI and NEMA, through various Government Ministries and Departments, are now mandated to take charge of managing natural resources in the country. The government has introduced regulations such as licensing and protected areas in the management of these resources. This explains the licensing system in the utilisation of mangroves and marine game reserves and parks as a way of restricting resource use and prevention of depletion.

From the findings, we can infer that, to some extent, this system is working. However, the community is worried about degradation of the environment and depletion of resources, including disappearance of whole species. The implication is that the community members are not satisfied with the efforts of the current mandate to properly manage and utilise the marine resources. There is evidence of poaching and corruption in the issuance of licenses for mangrove utilisation. There is also awareness about other causes of marine resource depletion such as pollution, encroachment, overexploitation and uncontrolled as well as unplanned development in areas close to the sea.

The findings also suggest that there is some form of rapprochement between the community and the various government agencies mandated to manage marine resources in the research area. This can be identified through the way the community members view the various development projects as providers of employment and economic empowerment. However, it is important, as the findings suggest, to mitigate their effect on the marine resource. This is because uncontrolled developments, especially along the shore line such as hotels, encroach on mangroves, fish handling sites and beach access points.

Thus, it would be important for the local community to play a role in the management of the marine resources. The argument for this is the fact that the community has always played a role in the management of resources because they interact with resources on a daily basis and in the process they are expected to conserve the resources because they benefit more. Should the resources be depleted, it is the community which will suffer most. Furthermore, the formation of Beach Management Organisations (BMOs) is a pointer to the community's efforts to ensure sustainable use/exploitation of resources.

Hind (2007) talks of the role played by the Great Barrier Reef, referring to the role played by the indigenous community to conserve the ecosystem. They consider the Reef to be sacred and home to many species, this symbolises all that generous in nature and serves to remind us of the sacred duty of communal guardianship.

The spirit of public participation as a Constitutional requirement allows the community to play a role in management of those affairs that affect it directly. Marine resources fall in this category for the Giriama community. The formation of community forestry associations (CFAs) which deal with terrestrial forests could be harnessed to facilitate participation in the management of the resources in this area. In this case, the role of the government, should be to regulate and provide advice on the sustainable use of marine resources. This will ensure that the natural resources sector is more organised.

This resonates very well with various anthropological studies which indicate that hot spots of high biodiversity are associated with regions where traditional societies are frequently found. In this circumstance, indigenous groups offer alternative knowledge and perspectives based on their own locally developed practices of resource use (Posey, 1985; Berkes *et al.* 2000; Hiepko, 2006; Johannes, 1993) or known as the indigenous knowledge-practice belief complex. The studies have also demonstrated that Indigenous knowledge and biodiversity are complementary phenomena essential to human development. Thus, the studies confirm that indigenous knowledge of ecological zones, natural resources, agriculture, aquaculture, forest and game management, to be far more sophisticated than previously assumed. Furthermore, this knowledge offers new models for development that are both "ecologically and socially sound" (Posey, 1985:145; Johannes, 1998).

The findings of this study suggest that marine resources are threatened by developments along the shore line and unsustainable resource use patterns such as beach seining, trawling and dynamite fishing. As Semesi (1998:23) and Johannes (1998:243) have noted, the rate and variety of human influences have increased to the point where a large proportion of the marine resources, especially the mangroves, are threatened with destruction. Semesi notes that the resources severely affected are either close to the urban centres or have been transformed into aquaculture. In many of the cases these are

commercial ventures, where the local communities are not directly involved or cannot afford the requisite large-scale capital investments. However, where resource areas have been declared sacred, such ventures have not taken off, vindicating the findings, which suggest that involvement of local communities in management decisions could pay off, especially when their cultural values are incorporated in the process.

Within the neo-structuralist framework, we can see societies or social assemblages as just one more ecosystem. The Giriama can be viewed as a structural ecosystem made of practices, beliefs, norms and knowledge. As a unique ecosystem, this society differs from other ecosystems and has unique properties, including its indigenous knowledge on marine resources. Therefore, allowing the Giriama community to participate in marine resources management will not only bring on board indigenous knowledge in the process but also incorporate local ethical considerations in the conservation regime.

The Giriama indigenous knowledge and ethics systems are not only hinged on a practical platform of biological interrelationships but extend to the ritual and belief systems. Thus, the Giriama have the ecological knowledge and technology which facilitate their adaptation to the physical environment, particularly the marine ecosystem. Through norms, beliefs, taboos and linguistic forms, their culture has evolved ways of managing the fragile marine ecosystem that is a source of their livelihoods. And overtime, they have been able to adopt various solutions from a number of alternatives. This is the basis of indigenous knowledge in the management of marine resources.

It is this cultural and ecological significance of the marine resources that has driven the Giriama community to conserve them. The mangrove ecosystem symbolically reflects the community's cultural and ecological resilience. This may be reflected in the linguistic metaphors such as taboos and proverbs. The proverbs, for instance, reflect a glowing tribute to the mangrove trees. They talk of strength, protection and resilience. The ritual significance of the mangrove ecosystem is manifested in the myriad prohibitions and taboos that regulate the utilisation of these resources. For instance, the taboos on interchanging the species in use is meant to instill a sense of responsibility and ethical treatment of natural resources among the community members. Then there is the declaration of seasonal harvesting of resources from the ecosystem and the declaration of

whole forests as sacred. These are demonstrations on the part of the community of the desire to be part of the conservation efforts for posterity outside the realm of official government conservation efforts.

These findings provide us with insights into the symbolic aspects of the social appropriation of the marine resources. The implication here is that there is not only an extension of social relationships between resources and humans and the accumulation of local environmental knowledge, but the relationship also involves the formation and symbolic expression of links with the spiritual world. That is why discussions of and responses to the beliefs on marine resources describe conceptions and representations of the natural world and its resources. From the neo-structural perspective this differs greatly from the industrial and market-oriented society in the urban areas of Kenya. It would appear as if there are two different societies in one. The basis of the difference is to be found in the attitude to and perception of the natural world and its resources, which ultimately defines the mode of exploitation. For neo-structural anthropologists interested in natural resources management, this may represent the extension of the borders of culture, to include ideas about ecology and natural resources.

We can then infer that the Giriama belief system, relating to marine resources through indigenous knowledge, demonstrates the human world's underlying non-material bond with the natural world, which is the heart of our material relationship with nature. This relationship unites three key components of knowledge: representation, organisation and legitimacy. Thus, by representing, organising and legitimising human relations with nature, we proceed to understand the process of material production. This understanding is essential to symbols and myths used by indigenous communities to represent ecosystems and the various resources found in them, in this case fisheries, mangroves and corals. Thus, the nature and extent of the exploitation of the environment is dependent on the way natural resources are tied to other behavioural aspects of the community. And herein lie the links between cultural and ecological survival.

For the Giriama, like many indigenous communities, the production process involved in natural resources generates a range of symbolic elements. These are the elements through which resources users act not only upon nature but in concert with super-natural forces. It

should be emphasized that the super-natural forces regulate resource use through a system of reward and punishment. Thus, together with defining a space for food production and projecting principles of social relations, marine resources are seen as the locus of representations and of the mythological imagination of indigenous communities.

The intimate relation of these people with their surroundings, and their greater dependency on the natural world when compared with urban-industrial societies, result in the cycles of nature (such as the arrival of schools of fish and the abundance of crops) being associated with mythical and religious explanations. In the final analysis, this may explain why fishers, for example, tie seasonal fishing to the cosmology about the turbulence of the sea during the periods when they are not allowed into the sea. We could extend this argument to include reasons behind the keen observations about the behaviour of the sea before any fishing is undertaken.

The findings on proverbs on marine resources provide us with insights into what anthropologists have always been fascinated about the complex interface between society, language and culture. These proverbs demonstrate that different languages seem to encapsulate different world views and different social realities. This is particularly crucial for natural resources management. This is because human beings gather knowledge basically for two purposes: survival and meaning. For the Giriama, the marine resources provide for both ends. The resources provide sources of survival and social meanings in their realities. This then may explain why the resources are very important for the community. It is through linguistic metaphors that humans try to understand and come to grips with the environment in order to survive.

Thus, the marine resources give the Giriama reasons for survival that go beyond the intuitive reaction to physical threats. The use of mangrove, fishery and coral metaphors in everyday conversation reminds the community of the symbolic importance of the resources. The resources are part and parcel of all kinds of activities which aim at building up social order. What this means is that the environment is much more than a set of material possibilities to which cultures, social organisations and kinship systems adapt. It is part of a very large communication system.

The language and semiotic system of the community is anchored in environmental landscapes, which in turn provide the epistemological system for the world view. This is not just at the structural level of cultural survival, but rather extends to the symbolic level where meaning is derived from environmental cues. Thus, in looking at the manner in which resources relate to culture, we may understand the symbolic structure of culture in relation to norms, beliefs, practices and knowledge in the human mind. These structures are expressed through language and its different genres and metaphors such as riddles, songs, proverbs and taboos.

It can, therefore, be argued that proverbs are one channel through which we can see the stability between nature and the human mind through culture. Cultural structures then stabilise themselves with nature through indigenous knowledge. Since indigenous knowledge is rooted in the socialisation process, proverbs are part of the process through which it is passed down generations. They provide society with an information base which facilitates communication and decision-making on everyday activities as well as long-term experiences. They are part of the dynamic information system influenced by cultural creativity and experimentation. The proverbs also demonstrate the process of learning attitudes and values for a sustainable future.

Therefore, indigenous knowledge can help to develop sensitive and caring values and attitudes and, thereby, promote a vision of a sustainable future. That explains why indigenous communities have lived in harmony with the environment and utilise resources without impairing nature's capacity to regenerate them. The Giriama way of living, like other indigenous communities, is sustainable. Indigenous knowledge shapes their values and attitudes towards the environment, and it is these attitudes and values which guide their actions and make them sustainable.

This is the basis of learning through culture. We can infer that indigenous knowledge is stored in culture in various forms, such as traditions, customs, folk stories, folk songs, folk dramas, legends, proverbs and myths. The use of these cultural items as resources is very effective in bringing indigenous knowledge alive for the environmental management strategies. They help in the conceptualization of the universe, places and issues not only in the local area but also beyond their immediate experience.

This is because the indigenous knowledge accumulated by these people and communities constitutes a reservoir of adaptations that are of great importance for long-term sustainability. The inference we can draw from the findings is that in reality, cultural diversity and biological diversity are two sides of the same coin. Living diversity in nature corresponds to a living diversity of cultures. It is also important to notice that the use of traditional ecological knowledge in the form of customary ecological management practices has been recognized as a potentially powerful conservation mechanism, particularly in countries where indigenous cultures are still largely extant.

CHAPTER EIGHT

SUMMARY, CONCLUSION AND RECOMMENDATION

8.1 introduction

This chapter presents summary of findings, conclusion and recommendations. The recommendations are divided into those for further research and those for policy formulation and implementation.

8.2 Summary of Findings

The Giriama community, just like many indigenous populations living subsistence lifestyles and relying on traditional practices have, to varying degrees, changed from being relatively autonomous societies to being interdependent within complex global relationships which involve national and international economies. This socio-economic and ecological change has resulted in the transformation of significant cultural traditions, many of which have previously been carried forward for generations by internal mechanisms of knowledge transfer. These mechanisms include proverbs, taboos, prohibitions, sayings and oral history through story telling or learning through practice. In many parts of the world these indigenous systems are now being forgotten as people adopt different ideas and values that originate outside their community.

This is exemplified in the research findings where knowledge about the resources is differentiated along gender and age lines. In some cases living close to the resources or being intimately involved in interacting with the resources enhances knowledge about them and therefore care for them. Thus, as the study postulated in the problem and rationale, changing human interactions within their environment occurs when younger people acquire values and lifestyles different from those of their ancestors so a discontinuity in knowledge transfer occurs. The knowledge of older members of the community is supplanted by the influx of alternative worldviews and so the direct connection to historical beliefs and practices is broken. Yet the knowledge of the ancestors is vital for appropriate interaction with the resources.

We have also demonstrated that attempts by development professionals and research experts to work without the input of local indigenous experts does not facilitate the

understanding of the social structures and biophysical features of the ecosystem that are the basis of livelihood practices and which support the system of knowledge. This is because bodies such as KMFRI, KFS, KWS and NEMA, tend to reify ecological knowledge as something abstract rather than something that is lived day-to-day. The reason is that governmental and research institutions have not captured the essence of indigenous knowledge. They have, in their protected areas approach, not realised that local and indigenous ecological knowledge itself generally transcends the nature-culture dichotomy.

Yet this is the nature-culture dichotomy that is so pervasive in western science-based management. In the science-based approach, ecosystems are reduced to component parts for the purposes of managing, which are looked as entirely separate from human activity. Among the Giriama, who were the subject of this study, there is no conscious effort on the part of those mandated to manage marine resources to build on traditional knowledge as a means of guiding change in the management of mangroves, corals and fisheries. As a result, knowledge that is embodied in locally specific belief and practice is slowly being eroded.

This study notes that indigenous knowledge itself is generally more grounded, integrated and holistic and nature is usually not regarded as an object to be measured and studied as something that exists separately from society. Indeed, many elements of the biophysical environment are imbued with human characteristics, so people relate to these features of the ecosystem on a relational and personal level making it less likely for the concept of 'nature' to be viewed as separate from humans. That is why indigenous ecological knowledge in this community is varied and rich.

This can be deduced from the very concept of the environment as understood by the community in many ways. The community's representation of space and what it comprises is evident in their ethno-taxonomical naming of various environmental phenomena. The community's taxonomy and nomenclature is a testimony that the Giriama people depend a lot on their environment and so pay great attention to it. They have an elaborate nomenclature for fisheries, mangroves and corals. In addition, their knowledge of different fish and mangrove habitats and their ecological functional roles

confirm that, apart from the scientific taxonomy, there are other systematic ways of classifying natural phenomena. Different resource species are elaborately identified and named.

The profound knowledge on the environment is also demonstrated by the classification of the various resources as fisheries, mangroves and corals. The respondents presented more than one hundred species and subspecies of fisheries. The classification is based on both behavioural patterns as well as physical features. Some species are named according to their habitats, which indicates detailed knowledge of fish behaviour. Some fish species are known to spawn in muddy flats and later migrate to the deep sea, while others stay in mangroves during the larvae stage and later migrate to the coral reefs as adults. This detailed knowledge of the migratory nature of these species is a demonstration of the importance of mangroves in the indigenous marine ecology.

That is why a significant aspect of the indigenous knowledge of the Giriama in regard to marine resources is their worldview that defines the relationship between the human world and the non-human world. This world view provides a framework for how to treat the non-human world respectfully. That is why the community has protocols and rituals that have to be followed in the course of resources use. In this community, like many other indigenous communities, people are discouraged from taking more than is needed from the natural world. We can draw this inference from the reasons why mangroves have designated functions and those functions are not to be changed. At the same time, some fish species can only be caught when they are mature.

In addition, the rich and elaborate knowledge of fisheries demonstrates an acute knowledge of nature and its constituent parts that is a function of both observation as well as apprenticeship. This is also a demonstration of how classification of the environment and the categorisation of its components cannot be the preserve of one culture or source of knowledge.

The society protocols also entail seasonal bans and a declaration of certain resources or whole ecosystems as sacred. The community has even gone to the extent of declaring some mangrove forests, reefs creeks and parts of the sea as evil, where human activities,

apart from cleansing and sacrificing, are not allowed. Coming together during the beginning of the fishing season provides opportunities to reinforce social relations and cultural knowledge and to maintain kinship ties through feasting, cleansing, and other social events.

Situating resource use within this larger social system ensures that cultural regulations are followed. It also ensures that resources are tended properly, and that the communal system of ownership and control of resources continues. Taboos and prohibitions on catching certain fish species at a given age, for example, is a conservation measure presented as superstition or taboo. There is also evidence of seasonal bans on catching certain fish such as *dagaa* and *simsim*. Yet indigenous knowledge on marine resource management in Kenya remains underutilised.

The Giriama people clearly possess a traditional conservation ethic. This means they are aware that they can deplete or otherwise damage their natural resources. Thus, they perceive a relationship between their activities and the state of their natural resources. In spite of the years of acculturation through external influences, those who directly deal with mangroves, fisheries and corals still hold onto the traditional conservation ethic. The community is still very strong on the conservation of marine resources. This can be deduced from the Giriama construction of this body of complex relationships and detailed concepts and symbols which is based on a long term empirical observation and is applied to the marine areas used by community members. The knowledge guides their behaviour and resource extraction strategies and is essential for predicting situations where sustainable marine resources management can be successful.

Therefore, indigenous knowledge helps the Giriama community to produce their own mental maps of the marine ecosystem that indicates to them where to find specific resources, classify them and extract the resources for sustainable use. In a sense, this knowledge directs resource use patterns. It produces a conservation ethic based on culturally patterned resource use. These patterns and structures as related in neo-structuralism, are products not of the physical environment and its resources per se, but of the cultural ecological, taxonomic and kinship perceptions or culturally formed images of the environment and its resources.

Finally, since this ethic exists, it provides an excellent foundation on which to build marine resource management and governance systems. These systems can then be planned around accepted local norms, practices, beliefs, symbols, values and associated customs. The fact that this ethic is still prevalent among the Giriama, may help explain why culturally sensitive and low cost efforts on the part of the government and other agencies can have a major impact on locally-based management. In this way we can incorporate indigenous marine resources management systems into modern methods of conservation. This is likely to improve awareness of fishing community concerns and their origins, which can lead to more informed interpretations of community-government management relations and allow for policies that better support not only local livelihoods, but also conservation objectives.

8.3 conclusion

The current study, therefore, concludes that by studying that body of knowledge that enabled people in the past to live in ecologically stable conditions, then finding and tapping into this base of abstract knowledge will help provide sustainable solutions for marine resource use today and in the future. If, however, knowledge is looked at as dependent on changing structures then, in essence, as social and ecological conditions change, the knowledge base may change as well, leading to unsustainable extractive practices because the social structures and ecological conditions that provided context for knowledge production in the past no longer function or function differently. It is then, order to assert that the belief system of the Giriama people, through their indigenous knowledge and management systems, demonstrated through indigenous nomenclature, taboos, proverbs and lived experience, has had a great contribution to the conservation of mangroves, fisheries, corals and coral reefs.

8.4 Recommendations

Indigenous knowledge in coastal marine societies is rich and diverse. In view of the conclusion, the study recommends the following:

8.4.1 Recommendations for further research

- Systematic anthropological studies by scholars to capture and evaluate indigenous knowledge on early warning systems, indigenous natural resource and ecosystem monitoring and evaluation.
- Further studies into indigenous knowledge systems in the context of sustainable livelihood initiatives and appropriate technologies. In this regard it is important to incorporate indigenous information gathering and management techniques into the scientific methods. This will enhance the robustness of the data gathering process.

8.4.2 Policy Recommendations

- The incorporation of local communities such as the Giriama people, through their indigenous knowledge systems, in future plans to manage natural resources by government agencies. From the findings, there are encouraging signs this approach is already meeting with success in some areas, where replanting mangroves is going on through community-based organisations. There is need for more of these organisations to be established.
- The integration and consultation of indigenous experts in the areas of conservation, environmental management and public policy.
- Policy instruments should take into account the needs, aspirations and contributions of local communities and their knowledge on marine and other natural resources. This should include issues that concern intellectual property and the appropriation of knowledge. This will facilitate the rapprochement between indigenous communities and other bodies involved in the management of resources at the coast and anywhere else in the country and the world. In this way, the local communities will not only feel appreciated but this will enhance natural resource management.

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Appendices

Appendix 1: In-depth interview guide

A. HISTORICAL BACKGROUND OF THE RESPONDENT

A. Gender of the respondent

B. Marital status ……..…….……..…

C. Age of the informant ……..…….

D. Religious affiliation …….

E. Ecological responsibility of respondent (Probe for rain makers or fishing expedition leaders, those who perform rituals of environmental nature……...

F. How long have you lived in this village? …….……..

G. How long have you interacted with the natural resources in the mangrove forests and the sea? .....

H. What is the place of marine resources in the community's cosmology? (probe for knowledge of the concepts of space, climate, weather, environment)

B. Physical Characteristics of Resources

1) Which species of mangroves and fisheries are you aware of?

2) Which type of resource species are you usually interested in? (probe for utilitarian and ritual significance)

3) Why are you interested in these resources? (Probe for disinterest in other resources)

4) What are the major climatic factors affecting the fisheries? Why do think so? What are the major climatic conditions that affect corals? Why do you think so? What are the major climatic conditions that affect mangroves? Why do you think so?

5) How are corals related to mangroves and fisheries in Giriama cosmology? Which is the most critical relationship between these resources? (Probe for traditional knowledge on species distribution, migration, behaviour, etc. Knowledge that members of the local community have of (what are in scientific terms) the biological and ecological attributes of species.

6) How do you monitor climatic conditions - rainfall, clouds, temperature, and wind? How is this related to the sea and mangroves? How are these elements related to the use of the resources?

7) Does this mean that you have a meteorological sequence that you follow?

8) Does this sequence influence the use of resources?

9) How are fisheries utilized in regard to the sequence of seasons? (Probe for species and catch for each season and seasonal bans)

10) How are mangroves utilized in regard to the sequence of seasons? (Probe for species utilization and seasonal bans)

11) How do these weather elements affect the fisheries and mangroves resources and their regeneration?

12) How do weather elements affect corals and their regeneration?

13) How are the mangroves and corals related to the rainfall pattern around the year?

14) How did you traditionally acquire knowledge over marine resource management and assessment techniques?

C. MONITORING OF RESOURCES

1. How do you classify mangrove ecosystem? (Probe for colour of leaves or stem, height, thickness of the stem and location)

2. Which species is dominant in the mangrove ecosystem? (Botanical composition) Why?

3. How and when are these species used?

4. How do you traditionally manage these different types of species and why?

5. How does ecological composition relate to (Probe for preferred species; poisonous plants; medicinal plants; ritual and symbolic significance of the species?

6. Have you seen any changes in botanical composition over the years due to either use or climatic change?

7. Are these changes positive or negative?

8. Do you face the problem of overuse in this community? (Probe for the indicators)

9. What ecological roles do mangroves play? (probe for breeding and spawning environment, protection for some marine or terrestrial animals, sources of food for marine and terrestrial animals)

10. How do you rate the mangrove biodiversity condition in terms of plant vigour? (Probe for the indicators of disease or health, presence of other species, both plants and animals around that plant)

11. What attributes do you use in assessing mangrove biodiversity?

12. What is the most significant attribute of the above-mentioned indicators?

13. What are the cultural and ritual prohibitions that apply to mangrove biodiversity management?

14. When are these sanctions applied?

15. What are the penalties for infringement of the prohibitions?

16. Who is responsible for enforcing the prohibitions and levying the penalties?

17. How do you classify the mangrove ecosystem?

D. Institutional set-up or arrangement

1. Who is responsible for the management of the resources?

2. What are the rules and regulations of use? Specifically what is the role of women and children in marine resource management and production, that is, collection of firewood, fishing, inventory?

3. In your opinion, what should be done to improve marine resource management system? (Probe for efforts to improve marine resource regeneration and productivity; Past and present attempts by external agencies (e.g., Government, NGOs, Fisheries Department) to bring awareness of resource threats to the community. Also, how these threats are communicated to children through schools and/or family members)

Appendix 2: Focus Group Discussion Guide

1. Indigenous knowledge systems
2. The Environment
3. Local beliefs concerning the environment
4. The main marine plants and animals in each area.
5. Resources and their uses
6. Classification of sea animal and plant.
7. Location of each species of fisheries and mangroves
8. Traditional ecology of the different marine species
9. Regulation of resources extraction Marine species detrimental to the community?
10. Responsibility for the protection and conservation of resources
11. Interaction with the environmental resources
12. Awareness about of changes in their environment or differences between different
13. Causes of depletion and remedial measures.
14. The main threats to marine resources.
15. Factors that have led to the breakdown of the traditional management systems.

Appendix 3: Key Informant Interview Guide

1. Could you give an over view of the resources found in the marine ecosystem this area

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2. What are the causes of marine resources depletion

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3. Considering the conservation efforts being undertaken, what is the role of the local community in the management of marine resources?

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4. There are diverse resource user groups, how can you advice on the sustainable use of marine resources?

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5. What is the perception of the local community in the conservation of the marine resources?

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6. How does development affect the use and management of marine resources in the area?

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7. Do you think the marine resources should be managed by the government and its agents alone?

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8. How does the institutional location of marine resources management mandate The influence the process of management and use

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9. In your opinion what is and should be the role of NGOs *vis-a-vis* that of the State in the management of the marine ecosystem?

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10. What should be done to ensure the sustainable use of marine resources?

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Appendix 4: Observation Checklist

1 The surroundings

2 Types of activities undertaken on the shore by men and women

3 Levels and types of pollution

4 Type of vegetation in the mangrove forest

5 Species of fish and their characteristics

6 Fishing gear

4. Mangrove species

5. Mangrove zones

6. Extent of degradation in the mangrove forests

7. Extent of degradation on corals

8. Fishing routes in the sea

9. Mangrove reforestation efforts

10. Coral preservation efforts

Appendix 5: Informed Consent Statement for the study tools

Study I.D. Number of Key informant/FGD Participants----------

Hello. My name is _____. I am working on research project with Institute of Anthropology, Gender and African Studies of the University of Nairobi. The research is on the role of indigenous knowledge on the utilisation and management of marine resources in this area. The aim of the study is to assess the status and sustainability marine resources management in order to draw lessons for improvement. I am seeking your permission to ask you some questions to learn more about the marine resources management in relation to indigenous knowledge in this area. The people we interview will be asked questions about their relationship with the mangroves, fisheries and corals.

The information you will provide shall be strictly confidential and will be used only for the purposes of this study. Your name or any other information that may identify you will not appear in any report from this study.

The interview will take about one and half hours. Your participation in the study is voluntary. You will also not receive any money for participating in the study.

If any problem arises, or if you have any questions, contact Khamati Shilabukha at the Institute of Anthropology, Gender and African Studies, University of Nairobi on Tel. No. (02) 381262/5 Ext. 28158. Or Cell: 0722850828

You now have an opportunity to ask me questions concerning the study and your consent to participate.

Do you have any questions? 1. YES 2. NO

Do you agree to participate in this study? 1. YES 2. NO

I certify that I read this statement to the respondent, that s/he fully understood its meaning, and that s/he verbally agreed to participate in the study

---------- **Interviewer's Signature**