Western Indian Ocean
JOURNAL OF
Marine Science

Volume 17 | Issue 1 | Jan – Jun 2018 | ISSN: 0856-860X

Chief Editor José Paula

Western Indian Ocean
JOURNAL OF
Marine Science

Published biannually

Aims and scope: The *Western Indian Ocean Journal of Marine Science* provides an avenue for the wide dissemination of high quality research generated in the Western Indian Ocean (WIO) region, in particular on the sustainable use of coastal and marine resources. This is central to the goal of supporting and promoting sustainable coastal development in the region, as well as contributing to the global base of marine science. The journal publishes original research articles dealing with all aspects of marine science and coastal management. Topics include, but are not limited to: theoretical studies, oceanography, marine biology and ecology, fisheries, recovery and restoration processes, legal and institutional frameworks, and interactions/relationships between humans and the coastal and marine environment. In addition, *Western Indian Ocean Journal of Marine Science* features state-of-the-art review articles and short communications. The journal will, from time to time, consist of special issues on major events or important thematic issues. Submitted articles are subjected to standard peer-review prior to publication.

Manuscript submissions should be preferably made via the African Journals Online (AJOL) submission platform (http://www.ajol.info/index.php/wiojms/about/submissions). Any queries and further editorial correspondence should be sent by e-mail to the Chief Editor, wiojms@fc.ul.pt. Details concerning the preparation and submission of articles can be found in each issue and at http://www.wiomsa.org/wio-journal-of-marine-science/ and AJOL site.

Disclaimer: Statements in the Journal reflect the views of the authors, and not necessarily those of WIOMSA, the editors or publisher.

ISSN 0856-860X

Cover image: Maputo (© Jose Paula, 2010)

Navigating the sea space: the nature and significance of giriama indigenous knowledge on marine resources

Khamati Shilabukha

Institute of Anthropology,
Gender and African Studies
University of Nairobi
P. O. Box 30197 Nairobi 00100 GPO
dennis.shilabukha@uonbi.ac.ke

Abstract

This paper presents the findings of a study on indigenous knowledge and management systems of marine resources among the Giriama people of the Kenyan north coast and their intimate relationship with their environment, especially marine resources. The product of this relationship is a profound knowledge of the resources dependent on indigenous ecological knowledge of marine resources. This knowledge is distributed in the community based on age, gender and professional affinity to the resources. Thus, the community has evolved an elaborate system of knowledge of the natural world such as species distribution, diurnal changes in the behaviour of the sea, and wind movement. This knowledge is instrumental in regulation of activities in the sea, mangrove forests and around coral reefs. As a result their indigenous knowledge has become an aspect of everyday experience of the marine environment as it helps distinguish the objects of experience, together with their similarities and differences.

Keywords: Culture, ecology, ecosystem, environment, indigenous knowledge, marine resources

Introduction

The Giriama are a bantu-speaking people found along Kenya's north coast. They are part of the larger Mijikenda community that straddles the Kenya – Tanzania border and are highly dependent on marine resources. They have developed elaborate knowledge systems of marine resources over the years. Their indigenous knowledge underpins discourse on the relationship between humans and nature and, therefore, the relevance of indigenous knowledge in the contemporary world (Clifton, 2003). The emphasis here being on the idea that humans' relationship with nature should be dialectical and holistic as opposed to dualistic (Willis, 1990). Giriama indigenous structure and systems of practice (experienced events), belief, and context (CPB), provides an epistemological basis for the understanding of indigenous ecological knowledge.

Paradigmatic Discourses on Human/ Nature Interactions in Anthropology

There is a very rich and elaborate corpus of anthropological literature on various kinds of indigenous environmental knowledge (Shilabukha, 2000; Willis, 1990; Robbins, 2010). For example, traditional agricultural practice is a major field of indigenous knowledge; others include traditional medicine and architecture. It is notable that much of the literature on indigenous knowledge, especially in anthropology, is not about ecological relationships (Berlin, 1975; Hunn, 1975; Chilisa, 2012; Berlin, 2016). Rather, it is 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 anthropological shift of emphasis from the documentation and taxonomy of species used by indigenous groups, to a consideration of functional and structural relationships and mechanisms, gave rise to the field of traditional ecological knowledge (Berkes, 1999).

Indigenous knowledge as a sub-field in anthropology borrows heavily from the cultural ecology tradition

of the anthropologist Julian Steward (Steward, 1958), who emphasised 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

but is not a sub-set of these fields because it often goes beyond the discipline of anthropology. However, a number of other anthropologists have criticised Steward's analysis of social reality because they consider it to be deficient in terms of consid-

Figure 1. Map of the research site.

Balee (1989) as well as Berkes (1999) have agreed with Steward's argument. For such anthropologists as Balee, Berkes and others, 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,

ering other important environmental variables such as disease and population pressure (Acheson, 2003; Williams and Baines, 1993). Steward has also been criticised for being subjective in identifying aspects of what he referred to as 'the affective environment' and the culture core (Netting, 1968; Ellen, 1982; Acheson, 2003).

The intellectual foundations of indigenous ecological knowledge are to be found in ethno-science (mainly ethno-botany) and human ecology (Berlin, 1975; Hunn, 1975). Effectively, the field has its roots in the study and documentation of lists of species identified, categorised and named by different indigenous groups, and elaborated a science of folk taxonomies of plants and animals and other environmental features such as soils (Berlin, 1975; Hunn, 1975). These studies are acknowledged in some recent studies, demonstrating how important they were in their influence (Shilabukha, 2000; Majid-Cooke, 2003; Gachihi, 2012). In discussing the evolution of this sub-field, it becomes instrumental to mention that 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; Warren *et al.*, 1995). 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).

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 (Berkes, 1993; 1999). 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; Berkes, 1999; Callicot, 1994). 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).

By the mid-1980s, the rapidly growing anthropological 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 (UNICED, 1987). Among other things, this 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, wetlands, marine, mountain and arid land ecosystems (Majid-Cooke, 2003).

In this study, indigenous ecological knowledge is analysed from the perspective of neo-structuralism. As Mendoza (2000) 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 many indigenous communities, including the Giriama. In the ensuing analysis, the relationship between indigenous knowledge and the conservation of marine resources is done through studying indigenous knowledge using time-space analysis (Mendoza, 2000). Mendoza's analysis can then be applied to local/indigenous knowledge in a global world. Inference made from this analysis is that the presence of indigenous knowledge has influence on the management and conservation of natural resources in many communities, making the analysis not only relevant to the Giriama context but also applicable to its use and management of mangroves, corals and fisheries. This is because, for the Giriama, many elements of the biophysical environment are imbued with human characteristics. So the community, through indigenous knowledge of the marine ecosystem, relates 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.

Placing the findings of this study in the context of other anthropological and cognate studies on indigenous ecological knowledge sheds light on how indigenous peoples, such as the Giriama, often depend on coastal resources for various livelihood and subsistence reasons (Zavarin, 1991; Ruddle, 1994; Hale *et al.*, 1998). There are implications for prudent use of resources that allows for adaptive management. This management is a function of lived and experiential learning which have immensely contributed to the emergence of elaborate management and governance systems. These systems have, in essence, evolved a sustainable and symbiotic relationship between the people and resources (Zavarin, 1991).

As a result, these communities have internalised considerable amounts of knowledge not only about

the resources, but also their management and use. Of course, if adopted by the larger scientific and policy making fraternity, such knowledge can potentially inform contemporary and future approaches to management. This can happen in two ways. First, indigenous knowledge is a rich source of baseline data to fill information gaps that cannot otherwise be addressed through pragmatic scientific approaches. Second, and more importantly, this knowledge could provide substitute management approaches from which scientists and resource managers might learn. In general, however, little attention has been given to the relevance of such knowledge for resource management (Ihezue, 2007). Acknowledging the existence of such knowledge would be the first step in the direction of plural application in a dynamic future of managing the environment in general, and resources found therein in particular (Shilabukha, 2007; Ihezue, 2007).

The foregoing suggests that the discourse on indigenous ecological knowledge is important for anthropological reflections on a broad range of interrogations related to nature-human relations. This is mainly so because anthropologists treat culture as the most important concept in understanding how different groups of people in various parts of the world perceive and interact with nature (Shilabukha, 2007). Yet indigenous knowledge is part of this culture. Indigenous people's perceptions and knowledge are in part shaped by their values, worldviews, and environmental ethics - religion in the broader sense (Robbins, 2010). This may explain why, 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).

In most of the literature reviewed regarding indigenous knowledge, it can be observed that many scholars have focussed on discussions of traditional ecological knowledge and indigenous knowledge of Australian and North American Indian peoples (Balee, 1989; Callicot, 1994) This in not necessarily bad. However, there are many other traditions of ecological knowledge found among various indigenous societies in Europe, South America and parts of Africa and Asia, which also deserve mention (Williams and Baines, 1993). Research and dissemination of information from these diverse cultures will not only enrich anthropological knowledge on the nature/culture nexus, but also stimulate other disciplinary discourses on indigenous knowledge. Such studies will also expand, where necessary and possible, national policy frameworks on conservation. This study is one such attempt.

Materials and Methods

The study was carried in area between Kisauni in Mombasa County and Matsangoni in Kilifi County on Kenya's north coast between June 2012 and December 2013. In Mombasa, the study site included villages in Kisauni and Bamburi, while in Kilifi County, it was conducted in villages in Shanzu, Mtwapa, Takaungu, Mwakirunge, Kanamai and Matsangoni (Fig. 1). (Source: Department of Geography and Environmental Studies, University of Nairobi).

The research site was chosen for the study on the basis of its geographic location and adjacency to the marine resources under consideration. Mangroves, corals and fisheries feature predominantly in the subsistence livelihoods of the people within the research site. 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. The inclusion/exclusion criteria used were membership of the Giriama community and proximity to the resources. The research design was descriptive-qualitative, and both exploratory and cross-sectional. Data were collected using observation, transect walks, informal interviews, in-depth interviews, focus group discussions (FGDs), and key informant interviews. 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. Since most of the data were qualitative, analysis was done through content analysis and presented through anecdotal quotes. Quantitative data were analysed by computation of means, percentages and ranges, and presented in frequencies and percentages.

Ethics statement

The findings presented in this paper were part of a PhD study entitled "*Indigenous knowledge and management systems among the Giriama of north coastal Kenya"*. The thesis was examined and passed at the Institute of Anthropology, Gender and African Studies, University of Nairobi in November 2015. A permit for the study was issued by the National Commission for Science, Technology and Innovation. Ethical considerations

were observed throughout the study. Verbal and written consent for participation in the study was sought from all the adults recruited after they were given information about the study. To ensure anonymity and confidentiality of the participants, personal identifiers were removed in the final thesis, apart from cases where respondents were insistent on being cited by name. This paper is part of the efforts to disseminate the findings of the study to professional colleagues who may be interested in the thematic area of study.

Results and Discussion

Background characteristics

The background characteristics of the respondents captured were gender, age, marital status and occupation.. Age is an important indicator of the level of knowledge on the marine ecosystem and resources while occupation may indicate the **sc**ope of interaction with the resources as well as a factor that determines the position of leadership of activities in the sea and mangrove forests. The gendered possession of knowledge was important, hence the need to record the gender of respondents. In this case, 25 (62.5%) of the respondents were men while 15 (37.5%) were women. In terms of age, respondents ranged from 21 to 70 years. The majority (80%) of the respondents were married, while slightly below a fifth (15%) were widowed. Only 5% were divorced.

The period the respondents had lived in the village ranged from 10 to 70 years, while time of interaction with the resources ranged from 5 to 47 years. One of the elders in Mtwapa described his experience with the marine resources thus:

> *'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.'*

Nature and Structure of Giriama Indigenous Knowledge of the Natural World

Among the Giriama, knowledge is generally tied to the ancestry of experience and is stored in the collective memories of the community elders and experts of various kinds. This knowledge is transmitted largely through non-written processes such as telling stories, creating relationships and establishing personal meaning. Therefore, each generation of fishers and mangrove cutters is expected to pass this knowledge to succeeding generations. Those who teach are mainly the elderly, ready to transit to the world of the living dead. This illuminates the deference and reverence for ancestors; the dependence on knowledge and skills passed from generation to generation. That is why indigenous knowledge on ecosystems among the Giriama is a function of perception, lived experience and interaction with nature. In this way, the community has developed an elaborate system of naming and categorizing the natural world. This system is essentially an aspect of everyday nomenclature of distinguishing aspects of nature through presence and absence, similarities and differences, as well as symmetry and asymmetry. As a result this indigenous nomenclature helps to mentally structure the natural world in relation to word meanings and experiences.

For the Giriama, just like many other indigenous communities, the environment is where all the resources are found and nurtured, including human beings. As the findings of this study indicate, in Giriama cosmology, the environment cannot be divided into different parts. Therefore, the environment, or the world, is a whole whose every component is connected to others. The marine ecosystem, together with all the resources found therein, is important to the functioning of the whole world.

Hence, as a Giriama, when you think about the earth, with all the oceans, with their (tides) rising and ebbing, with the forests and their inhabitants, the moon shining upon them at night and the sun by day, that is the environment. When you think of the water in oceans, rivers, 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; 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 from inland into the blue waters; 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. All these make up the environment. Are there boundaries? The Giriama can only fathom contiguous, but not dichotomous borders. They talk about parts of the environment, one by one. Natural resources are referred to as *mali ya mulungu mwenge,* which loosely translates to God's natural (or real) wealth. The Giriama have a strong sense of belief in the supernatural, the reference to God is connected to ancestors, who are intermediaries between the living and *Mulungu*

mwenge (the Supreme Being). The deference accorded to ancestors allows one to acquire knowledge about the resources as well as how to utilise them.

In this community, the natural world is considered sacred and the property of the Supreme Being (*Mulungu).* According to the participants in one FGD at Mtwapa, *Mulungu* directs how the resources should be used because they are sacred and belong to everyone in the community. Some mangrove species, coral reefs and fisheries are not touchable. In some instances, seasonal bans are pronounced on some sections of mangrove forests or the sea, or some species. These bans are enforced until certain rituals or ceremonies are performed. Thus, community members inherit knowledge about the environment from their parents and experts who obtained it from ancestors; the custodians of this information. Because the environment is imperative to the Giriama people, this may explain why the community retains knowledge of different environmental features and their place in the ecosystem.

Since all the resources are considered the property of the Supreme Being, the spiritual connection between the human and natural world is apparent. However, some resources are particularly deified and considered the property of ancestors. This is typical of particular medicinal plants in the mangrove ecosystem, or entire mangrove forests, creeks and coral reefs. Some fish species are also considered taboo due to biological as well as symbolic reasons. For instance, mangrove species such as *mchu* are considered to be the house of sea spirits and so must be taken care of meticulously by herbal healers. Andersen *et al.* (2004) found similar ideas in their study on traditional ecological knowledge among the Eskimo people of Alaska in regard to subsistence harvest of non-Salmon fish in the Koyukuk River Drainage.

Many other anthropologists have similarly found connections between knowledge of the natural environment and the complex of context, belief and practice in areas inhabited by indigenous communities. In Tonga, for instance, Malm (2009) found that what one sees depends on what one knows. And what one knows is a function of how one was socialised to know. Among the Giriama, people have gained deep insights based on interpretations made in connecting life with the ever-present nature. That is why the concept of the environment is understood in many ways as demonstrated in the community's representation of space, and what it comprises.

This is also the reason why the distribution of indigenous knowledge on the marine resources is not homogenous. It is differentiated according to experiences, gender, age and occupation of individuals in regard to interaction with the resources. In reference to diverse occupations, rain makers, healers, fishing expedition leaders, those who perform rituals of an environmental nature, and some with multiple roles, were identified in the present study. The ritual, spiritual, religious and physical value of the resources was captured vividly by the respondents.

Considering indigenous ecological knowledge according to gender among the Giriama, men spend more time outdoors compared to women, hence they interact more with the resources compared to women, an aspect of the gender roles and ritual occupation of the public and private spaces in the community. Thus, the roles of cutting mangroves, building and fishing are part of men's public domain activities. The implication is that men are knowledgeable about mangroves and fisheries, their distribution and characteristics. Men are also responsible for carrying out rituals related to mangrove cutting or fishing. Women are responsible for gleaning, picking those species found near the shore or shallow waters. Women are also healers; they collect leaves and roots of the mangroves. 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 1.

Like other communities, the stock of ecological knowledge is distributed differently in the Giriama population, whereas culture is understood in terms of sharing, depending on spatial, social and cohort experiences. Indigenous knowledge gives the Giriama individual the capacity for orientation with marine resources. The knowledge structures the individual's understanding of the world, and provides purposeful ways of acting, guiding interaction with marine resources, and providing rules of extraction and utilisation through context, practice and belief. This then lends itself to management efforts, leading to conservation outcomes layered in terms of age, gender and occupation.

Indigenous Knowledge and Classification of the Features of the Natural World

For the Giriama, natural environmental features can be divided into land, water and air. In this classification, land is the area of the environment which is dry. There is no river, lake or ocean water on it. It is locally referred by the Kiswahili phrase *nchi kaavu*. Water is

to be found in lakes, rivers and the ocean. Air (*hewa, anga*) is unseen. All these components of the environment are useful. 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. The use of lexical categories to identify eco-zones that reflect the local inhabitants' intimate connection with marine nature come into place. Similarly, symbolic kinship ties with the natural environment is often based on a strong spiritual connection with Giriama ancestors and the land where their ancestors are buried, as well as on subsistence needs.

Therefore, these 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 through humour, humility, tolerance, observation, experience, social interaction, and listening to the conversations and interrogations of the natural and spiritual worlds.

Furthermore, the ritual, spiritual, religious and physical value of the resources was captured vividly by the respondents. According to one female healer in Bamburi, the environment is the provider of food and livelihood. It contains the resources the community is 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. The Giriama call them '*palani*'. Such spaces are mostly used by the community elders and the diseased who attend the rituals. Young people may not be allowed into these areas.

The physical world is very important to the Giriama people. According to the accounts of the respondents, it provides 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.

Table 1. 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

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 concept of the environment is referred to as *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).

As the findings of the study indicate, the Giriama people perceive the natural world in ways that suit them and their particular context through a strong tradition of spiritual and cosmological ties to environmental knowledge. This knowledge is rich, diverse and vibrant and it helps the community to adapt to their physical environment, biologically as well as ritually. This ties in with anthropological interest to relate ecological survival to cultural institutions that pursue livelihoods (Kuper, 2014). It is apparent that the Giriama practice 'ecological survival' in their relationship with nature, through indigenous knowledge. Therefore, the community takes the physical world and the resources found in it as much more than a set of material possibilities to which their culture, social organisation and kinship system have adapted, for provision of materials for reflection and premises for action making the concept of 'knowledge' to situate itself in a particular and unequivocal way relative to events, actions, and social relationships (Barth, 2002).

For this community, an important aspect of the marine environment and resources is the sea. Locally, referred to *ziwa* or *bahari,* the sea is an important aspect of the natural world because seawater is the home of the many useful 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 one male elder in Mtwapa, there is an umbilical relationship between sea water and those resources found in the sea. He intimated that the 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.

In Giriama cosmology, an interesting aspect of the marine environment, in particular reference to sea water, is the assertion that the sea is not a massive boundless body of water. In that sense, the sea is demarcated in terms of cognitive or oral maps through lexical categories which reflect the worldview of how the land and seascapes are organised and utilised. Cognitive mapping allows for the formation of a graphic representation of oral (cultural) maps of various marine ecological zones (including reef locations and fisheries movements) and human activities. According to one elder in Kilifi, 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 power over the rest. When he is *tired* (old) and wants to retire, he will leave the secrets to his son.

The cognitive maps are important for fishers and those working in the mangrove forests. These maps are facilitators of knowledge about the spatial distribution of resources in the sea as well as mangrove forests, such as coral mining areas, fishing spots or mangrove cutting areas. This knowledge is converted into concepts which are frequently named, especially if they are socially and economically important linguistic reference points. Therefore, finding a fishing spot in the immensity and vastness of the sea is not about luck. Each fishing expedition has a leader and that leader must be competent to sail at night guided by the position of the moon and stars, whether physically visible or not, in order to locate the best and most productive fishing grounds. The leader should be vastly and proficiently erudite of the routes in the vast sea,

by use of cognitive maps. According to a renowned fisher in Kanamai, the cognitive maps are constructed through observing routes of water running along the direction of coral reefs and the caves found in the sea. Each expedition has its own system of routes that is not used by any other. The more routes the expedition leader discovers and keeps surreptitiously secret, the more fishing spots he claims and the more veneration he gets within the community.

The cognitive maps for the Giriama can be inferred to imply the use of their gen and ken of the marine environment 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 among many indigenous communities around the world. This has then been used for depicting the location of important resource zones and sacred sites. For instance, in a 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 has also been demonstrated by Alexander and van Djik (1996).

Mangroves, fisheries and corals hold a very special place in Giriama cosmology. Some wearing worn out boots, others barefoot, fishers, mangrove cutters and the coral reef explorers wade into the deep sea from the shallow muddy shore, or make their way into the sea through the forest. Over the years they have learned everything there is to know about the fish types, the trees in the lush forest and the shiny underwater seascapes that form the corals and the reef. They know all the species and their associates. Without the sea water, there would be no fisheries, mangroves, nor the reefs and their inhabitants. And without the mangroves, there would be no forests; without the forests, there would be no trees.

Therefore, the Giriama also identify, name and classify marine resources as part of their indigenous taxonomy which forms an integral aspect of the community's indigenous ecological knowledge. This knowledge stems from the fact that traditionally, the Giriama depend on the resources and exploit the environment for rituals and livelihoods, hence the need for classification. The community uses various criteria to classify the resources. For a start, marine resources are classified into inter-tidal zones, the mangrove forests, the coral reef, and the open deep sea. The classification of the areas has remarkable geo-spatial as well as ritual significance.

Mangroves form a very important part of the natural world in general and marine ecosystem in particular. For the community, the forest exists because the trees have not been cut down *en masse*. As exemplified by a 67-year-old elder at Mtwapa, the forest is part of the creation given to their ancestors for 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 also used to heal the wounds of the circumcised. Dyes processed from the bark can also be extracted and used to colour the women for beauty purposes. In modern times, mangroves have attracted many tourists, both domestic and international, to the region.

Therefore, mangroves are not just the fringing vegetation along the lagoons, estuaries and creeks. They are a major source of livelihoods and have esthetic, spiritual and cosmological significance. Mangroves also provide important nursery, shelter and feeding habitats for a wide array of fishes, crustaceans and molluscs, which are utilised in commercial and subsistence fisheries. Mangroves also provide medicine and firewood apart from providing shade for the *mirindi*, (seaweed), which women collect for subsistence as well as commercial use. Young women only collect *mirindi* and firewood and only those who are trained in medicinal herbs can access trees with medicinal properties as these are the property of the ancestors. Ancestors can only talk to those who are invited to the trade. Among the women, it is those who no longer menstruate, or have stopped giving birth, that are invited.

According to some elders in Matsangoni and Mwakirunge, the significance 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. There is a symbiotic relationship between the fishers and the birds. 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 rapidly 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'. 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 locate them in the sea water.

The community acknowledges that 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 limited to the trees. There are other resources found in the mangroves and the waters surrounding them. As pointed out earlier, these resources are extracted according to age and gender.

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 to one 57 year old male respondent 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 the real sense refers to the commonest and most widespread of the species, *Rhyzophora mucronata.* This is the hardest of the species. As described by the respondents, the *Rhyzophora mucronata* trees are of average size and have stilt arch and prop roots that function to strengthen the tree stand.

Another species described is locally known as *mlilana* (*Sonneratia alba*). 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 pompom-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.

The *mkandaa (Ceriops tagal*) 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. Then there is *muia/mkoko wimbi (Bruguiera gymnorhiza)* whose seeds germinate while still attached to the tree. 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 where it can grow up to 20 metres. Absence of salty conditions stunts its

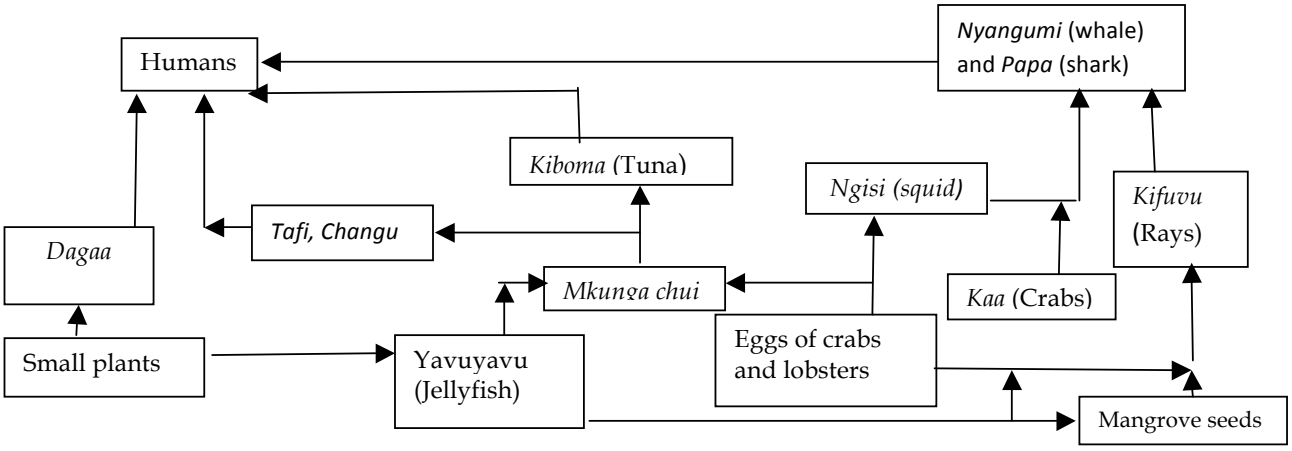

Figure 2. An indigenous food web and trophic levels for marine organisms.

growth. Its wood is used mainly for building material, roof supports and firewood.

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. The respondents also named and described the looking-glass *msikundazi,* also known as *mkungu (Heritiera littoralis).* 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.* Finally, there is *mchu* (*Avicennia marina*), which is sometimes referred to as *mtu* (person). It is also called *mtswi* (or white mangrove). The white mangrove is considered sacred among the Giriama people.

Another important resource are corals and coral reefs. They are known locally as *matumbawe* and *miamba ya baharini* (rocks of the ocean), respectively. They are classified at two levels. One parameter is according to the amount of life found in them. Thus, dry (or dead) rocks, and the living corals which are still breathing, are identified. The first category are found along the shore or inland where there is no water to nurture them. They are effectively dead. Corals are also classified according to the size of the rocks, which is also a function of their location. In this case, there are 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. Coral reefs provide habitats for marine fish species for feeding and spawning. Corals and coral reefs are the houses and resting places for some fish species. Additionally, they provide fresh air for the fish which they take in through their breathing organs, gills (locally called *mathefu*).

The Giriama classify all the animal species found in the sea as fish (*samaki)*. The number of aquatic organisms distinguished and named by the Giriama fishers is substantial, 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 fish, there are those species found among corals, those found in mangroves, and those found in the open deep sea. The location of the species is a function of adaptation to the conditions as well as their survival needs.

The respondents could construct food webs and energy levels based on interaction with resources over a long period. At the lowest point are species that feed on planktons and mangrove droppings; they include *mkizi* (cuttlefish) and *tafi* (mudfish). Then there are the *changu* (Variegated emperor) that feeds on other species such as small crabs and worms. Then there are the *tewa* (Rock fish) 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), *papa* (the shark), and *Pomboo domo-refu* (the dolphin), which respondents indicated do not lay eggs, but give birth. The dolphin is the most intelligent and it feeds on sea grass and weeds. Another species is the barracuda, locally called *tangesi,* and *ngisi* (squid) which feeds on other sea species. The food web and trophic levels in Fig. 1 was constructed from information gathered from elders in a

participatory process. It is based on the description of the food different fishes feed on. Therefore, much as the food web may resemble a typical scientific one, although derived from indigenous description, and implies that these fishers have deep knowledge on the food webs and trophic levels in the marine ecosystem.

Giriama knowledge of the larger ecosystem and the relationship between different aspects of it which provides habitat for valued marine species includes broad physical and biological features such as the deep sea itself, the inter-tidal zone, the shallow areas of the sea, and the outer border where it drops off into the ocean depths. Therefore, for the Giriama, the environment is not a "vast blank slate" in the ordinary course of life, a space simply awaiting the imposition of cultural order. Instead in the course of their daily interactional activities, people acquire intimate knowledge of the environment, and discover meaningful patterns.

Evidence for this may be found in their ecological knowledge in general and taxonomic naming of various elements that exist in the marine environment. Their dependence on the marine resources highlights the relationship between their 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, such as the different mangrove and fish species, according to location, characteristics and use. The vast ocean is also categorised along utilitarian as well as ritual and symbolic schema.

In their own studies, anthropologists Fraser *et al.* (2006), Diegues (2001), and Cunha (1997), have also brought to the fore the cultural perception of the relationship between land and sea space, highlighting the perception indigenous people have of the relationship between physical characteristics of the environment and the social production of knowledge. Among the Giriama, knowledge of the environment is culturally produced, accumulated through professional practice and continually recreated according to the features of the maritime environment which presents itself as cyclic, mobile, and unpredictable. 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 is similar to what Oso (2007) found among the Yoruba of Nigeria. In this community, there are villages which specialise in producing herbal medicine. Some of the herbs used in healing grow naturally, while others are planted. Similarities 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 floral consciousness. This knowledge is transmitted to herbal healers through spiritual visitations, visions or trances.

Indigenous Meteorology and Seasonal Work on Fisheries, Mangroves and Corals

The local community has internalised the weather changes that influence the tidal schedules over the years. Thus, 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 this work in the sea, fishing or cutting mangroves. The fishermen monitor changes in climatic conditions by observing. For instance, dark, grey clouds indicate the onset of rainfall, while increase or decrease in water temperature and change in the direction of wind indicate a change of seasons. Another source of meteorological knowledge is the profound knowledge of the behaviour of the sea in terms of wave turbulence and water colour.

The colour of the seawater is key in predicting tidal and weather changes. If the water is dark (described as dirty) and turbulent, such that one cannot see beyond a few centimetres, rain is on the way and no activities should be undertaken in the sea or mangroves. Otherwise, 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 abundance 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. The weather changes enable people, especially fishermen*

to know the behaviour of fish. 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.

The behaviour of mangroves, fish and corals are not only indicators of change in weather and climatic conditions, but also an indicator of the effect of weather on the resources. According to mangrove cutters, heavy rainfall that carries soil and other rubbish to the mangrove ecosystem leads to flooding that covers the breathing roots of the mangroves, which can then die. Therefore, rainfall can cause negative effects on mangrove forests. Strength of the wind also affects the mangroves as heavy winds can break the branches. Temperature also affects the mangroves as it enhances evaporation that exposes the breathing roots making them die. Weather elements also affect the regeneration of mangroves. The FGDs reported that 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 at the end facing down. On falling, the fruits penetrate the ground, after which the seed inside the fruit germinates leading to regeneration. Corals are also affected by climatic conditions in various ways. Heavy rainfall leads to floods from the rivers. These cover the corals and kill them. Very high temperatures lead to evaporation of the waters hence exposing the corals, which die.

The inference here is that weather, especially temperature, also affect species distribution and migration. High temperatures usually bring many fish to the shores. Wind direction helps fish locate their food and enemies and so contribute to species distribution, behaviour and migration. Clouds also offer clues for interaction with marine resources and the concentration of the clouds in the sky is key, as this influences catch prospects. Heavy cloud cover, known as *kolowa,* leads to the presence of many fish; a positive prospect for fishers. Fish usually breed during the cool weather or season when there is moderate sunshine for the survival of the young fish. There are some fish species that thrive in windy and cloudy conditions, for example, the shoaling *simsim.* These are a delicacy, and they are dangerous to follow. One elder at Mtwapa revealed that 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, hence the paths to be followed by humans.

A fisher in Kanamai intimated that 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*. 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. As mentioned, heavy cloud cover, known as *kolowa*, leads to the presence of many fish, which then means positive prospects for fishers.

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. In Takaungu, a female healer informed us that 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. Fishers keenly observe these signs from nature, which they have observed for a long period. This also has implications for catching fish and working in the mangrove forests.

Meteorological and climatic insights depict knowledge on seasonal behaviour of living and non-living aspects of the environment. The Giriama have internalised the names and behavioural patterns of mangroves and fish species, making it possible to know when and where to catch certain fish species. This knowledge regulates activities in the mangrove forests as well as the sea. Those going into the sea or mangroves must take note of the schedules and seasonal changes such as temperature, wind, waves and cloud cover. It is noteworthy that fishing is an occupation undertaken as a family, clan or lineage, meaning that knowledge about fish behaviour is kept within these confines of the community, although this information is available to those who wish to join fishing as a profession. In his study in Msambweni, Kwale County of south coastal Kenya, Shilabukha (2000) found similar ideas among the Digo

community regarding mangroves. This is probably because the Digo are also a Miji-kenda community.

In their studies, Wagner and da Silva (2014) and Drew (2005) have demonstrated that indigenous meteorological expertise is used in forecasting weather and seasonal changes in many indigenous communities around the world. These studies have identified and documented evidence which reveals that communities observe changes in their climate over long periods of time which then enable them to correctly predict atmospheric changes. Through this knowledge, communities have substantial understanding of what goes on around them and how they should make adjustments to ensure their livelihoods continue.

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). The movement of a certain bird which looks like a duck or cattle egret, locally called *haahor,* indicates seasonal changes. When this bird moves from the south to north, making its sound "*Kwaaa kwaaakwaa",* it is an indication that there will be plenty of rainfall. When the bird flies southwards, it is an indication of less rain, an approaching dry season, or in some cases, drought. Likewise, when a species of an old frog, locally referred to as *yakase,* are heard in May to June, it is a sign 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. Using this signal, farmers can begin preparing their fields for the planting season. The frogs are usually heard in June or July (Gyampoh and Asante, 2011).

In the same community, it was reported that a tree known as *kakapenpen* or *nkudua,* is also closely monitored for clues of imminent change in weather or season. The fruit of this tree does not always ripen, therefore, when it bears fruit and the fruit ripens, the rainy season is near (Gyampoh and Asante, 2011). These anthropologists have also found that the Tallensi use the behaviour of invertebrates to predict weather changes. 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. They then 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.

From these studies, it can be inferred 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 terrestrial as well marine environments. This knowledge is also a reflection of perception involving process and self-organisation, making indigenous knowledge a guiding metaphor. Therefore, indigenous meteorology should be analysed and presents as the master science of ecological survival for the community. In the same way, Ruddle (2000) notes, '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, climatic and weather patterns, it is crucial to get a firm understanding of a society's indigenous knowledge base, and the cosmological system underlying it.

This may explain why indigenous ecological knowledge of climatic and weather patterns is the reason why fishing is not undertaken all year round among the Giriama. The fishing season begins in October and ends in April. The climatic conditions, especially the direction of the wind, are a factor to consider. Fishers have internalised these conditions. The south to north winds herald the beginning of the dry season, *kusi.* Fish swim along with these winds. This is the time to go fishing because the sea is generally calm and the temperatures low. When the winds change direction, the sea begins to change colour and becomes rough. It is dangerous to go into the sea in such conditions. This is the beginning of the wet season and, therefore, no fishing takes place. Fishing is regulated in this way. The species availability and catch differs in different seasons. Some species appear during the wet season while others appear during the dry season, and others are present year round.

In this regard, Giriama indigenous meteorology identifies and recognizes two seasons in the normal calendar year, which are affected by the direction of two seasonal winds, *kusi* (blowing south to north) and *kasi* (blowing north to south). The two winds have different hydrological and temperature implications. These

climatic and seasonal factors affect the way the community interacts with the marine resources. The major factors are rainfall, wind and temperature. Therefore, the ecological experts in the community monitor the climatic conditions that affect the resources for the onset or end of the fishing season.

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 at the onset of the fishing season. They are referred to in that way because they are remnants from the previous season. After the preparation of the meal, the fishers take their boats to a central place in the deep sea and anchor them. This specific place is called *kitwani* (at the head), where fishers of an expedition go to at the beginning of every season. There are many *kitwani* places in the sea. The choice of the site is based on tradition, although no reason was given for its choice. A number of rituals are performed including prayers, and libations are poured into the sea to appease the gods, ancestors and other spirits. After the praying they burn *ubani* (or incense). It is here that the installation of new fishing expedition skippers occurs.

To confirm that their prayers have been received well, one of the party must experience a seizure and 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.

At the end of the half hour, the one in the water resurfaces from the deep sea unscathed. Upon his re-emergence, 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 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.

The identification and choice of a particular spot in the open sea is puzzling to a casual observer. However, 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 fisher communities and the marine environment. In a related study, Wavey (1993) 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.

If the choice of the place called *kitwani* is considered, 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. The ceremonies also point to the beginning of the fishing season, because prior to the ceremonies, no fishing is allowed in the sea. The elders are aware that many fish species spawn during the period of inter-seasonal rest for the fishers. Thus, these prohibitions and taboos are used to mask the natural cycle of replenishment.

The immersion of the man in a trance makes him the messenger to the origin of the community, which connects the distant past through the present to the near, yet unforeseeable future, deep into posterity for the continuity 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 that may bring forth posterity. This immersion also anticipates the contemporary culture as the creation of the distant past indigenous knowledge of nature unfolding in utilitarian categories of classification, management and use. The immersion pieces together the prelude to the awareness that led to the identification and subsequent classification of the components of the empirical environment which forms the basis for

contemporary 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 can be explained as a model of reality that combines myth with the empirical nature through culture because it brings forth information about the coming season. The gen and ken is defined and deified 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. The entry of the man into the sea symbolises the death of the old season, leading to a rebirth, witnessed through re-emergence, heralding the new season of work in the marine environment. As Gachihi (2012) noted, rituals carried out by elders related to natural resources reveal symbolism of death and rebirth, depletion and regeneration as well as pollution and purification. These ceremonies are an admission of human limits in regard to the control of natural forces, in spite of knowledge of the same.

Therefore, the ritual behaviour of a community also forms part of the perception and knowledge repertoire as well as scheduling of events that characterise resource use. Activities are scheduled to indicate the start and end of the fishing season as well as entry into the mangrove forests. The fact that the particular place is chosen through tradition and the reason it is chosen is unknown is indicative of the ritual importance of fishing in the community. The specific area in the sea where rituals take place points to the indigenous geographical information systems (GIS), a connection between physical and ritual space through indigenous GIS. 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 "the cognitive skill set of fishermen" (Maldonado, 2005).

Conclusion

There is a very vibrant knowledge of the marine environment and its resources among the Giriama. This has become refined, and should be allowed space in policy documents and research agenda since its influence can no longer be ignored. 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.

This study brings out the contextual, relational and experiential nature of indigenous knowledge among the Giriama in regard to the natural world in general, and marine resources in particular. This indigenous ecological knowledge is not only based on a worldview but also on the culture that respects wholeness, community and harmony which are deeply embedded in beliefs, norms, practices and values. Among the Giriama 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 through knowledge, including that of nature and respect for it. Thus, indigenous knowledge of time, space, nature and resources among the Giriama emphasises 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.

From this study and other anthropological studies on human/nature interactions, it can be inferred that ecosystems are in part socially constructed, and resource management and conservation practices in indigenous systems are based on a variety of social processes. One facet is concerned with the generation, accumulation and transmission of indigenous knowledge. The second could be about the edifice and dynamic subtleties of institutions, together with control, guidance and regulations that run those institutions. Yet, a third set also needs to be contended with, which is about rituals and ceremonies. These provide the contextual meaning to the cultural processes for the internalisation of indigenous ecological knowledge practices. Cosmology also comes into play, and is concerned with the world view and cultural values of the group in question. Each of the processes is assimilated and fused into a vortex of cultural practices in various places in the world.

Consequently, indigenous knowledge cannot be simply analysed at the level of cerebral activity only as 'knowledge' or 'technique, but also as a knowledge/practice/belief complex in which the context

is provided by culture and history. Accordingly, the importance of Traditional Ecological Knowledge (TEK) in the conservation of biodiversity, and as shown in this study, is demonstrable in the sense that one cannot merely learn from traditional techniques of biodiversity conservation outside of their cultural context. Nor can one discuss, in a decontextualised way, the possible contribution of TEK to sustainable land use, environmental assessment or ecological restoration. It is the nature and significance of this indigenous knowledge, developed over millennia, that facilitates navigation of the marine space by the Giriama people, in search of livelihoods, through spiritual harmony between the human world and nature.

References

Acheson J (2003) Capturing the commons: Devising institutions to manage the marine lobster industry. University Press of New England, Lebanon, NH. 264 pp

Alexander A, Van Djik J (1996) Scientific knowledge and indigenous perception of area, weight and space. Indigenous Knowledge and Development Monitor 4 (3): 15-17

Andersen D, Brown C, Walker RJ, Elkin K (2004) Traditional ecological knowledge and contemporary subsistence harvest of non-salmon fish in the Koyukuk River Drainage, Alaska. Technical Paper No. 282. ADF&G, Fairbanks. 165 pp

Balee W (1989) The culture of Amazonian forests. In: Posey DA, Balee, W (eds) Resource management in Amazonia: Indigenous and folk strategies, Volume 7, pp 1-21. The New York Botanical Garden, Bronx, NY. 289 pp

Barth, F (2002) An anthropology of knowledge. Current Anthropology 43 (1): 1-11

Berkes, F (1993) Traditional ecological knowledge in perspective. In: JT Inglis (ed) Traditional ecological knowledge: Concepts and cases, pp 1-9. International Development Research Centre (IDRC), Ottawa. 150 pp

Berkes F (1999) Sacred ecology: Traditional ecological knowledge and resource management. Taylor & Francis, Philadelphia, PA. 209 pp

Berlin B (1975) Folk semantics in relation to biological classification and nomenclature. Annual Review of Ecology and Semantics 4: 259-271

Berlin B (2016) Ethno-biological classification: Principles of categorization of plants and animals in traditional societies. Princeton University Press, Princeton. 335 pp

Callicott JB (1994) Earth's insight: A multicultural survey of ecological ethics from the Mediterranean Basin to the Australian outback. University of California Press, Berkeley, CA. 285 pp

Chilisa B (2012). Indigenous research methodologies. Sage, Los Angeles. 343 pp

Clifton J 2003. Prospects for co-management in Indonesia's marine protected areas, Marine Policy 27: 389-395

Cunha L (1997) Space and territoriality in the world of artisanal fishing. In: Diegues AC (ed) Tradition and social change in the coastal communities of Brazil, pp 48-51. NUPAUB-USP, São Paulo. 122 pp

Diegues AC (2001) Traditional fisheries knowledge and social appropriation of marine resources in Brazil. Paper presented at Mare Conference on People and the Sea, Amsterdam, August/September, 2001. 20 pp

Drew JA (2005) Use of traditional ecological knowledge in marine conservation. Conservation Biology 19 (4): 1286-1293

Ellen, C (1982) Systems and regulation. In: Ellen C (ed) Environment, subsistence and system: The ecology of small-scale social formations, pp 177-203. Cambridge University Press, Cambridge. 120 pp

Fraser, EDG, Dougill A, Mabee W, Reed MS, McAlpine, P (2006) Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. Journal of Environmental Management 78 (2): 114-127

Gachihi RN (2012) Sacred folk healing and conservation of kaya forests, coastal Kenya. MA Thesis, Institute of Anthropology, Gender and African Studies, University of Nairobi. 221 pp

Gyampoh AB, Winston AA (2011). Mapping and documenting indigenous knowledge in climate change adaptation in Ghana. UNDP, New York. 139 pp

Hale LZ, Meltzer E, Ngoile M (1998) Application to international experience of formulation of national policy for coastal management for the Republic of South Africa. Coastal Resource Centre, University of Rhode Island, Narragansett. 89 pp

Hunn E (1975) Cognitive processes in folk ornithology: The identification of gulls. Working Paper 42: 73. Language–Behaviour Research Laboratory, University of California Press, Berkeley. 73 pp

Ihezue L (2007) Developing cultural industries in Nigeria: A case for rural women integration through micro-credit. In: Babawale T (ed) The Place of research and studies in the development of Africa and the African Diaspora, pp 318-331. Centre for Black and African Arts and Civilisation (CBAAC), Lagos. 386 pp

Kuper A (2014) Anthropology and anthropologists: The modern British School. Routledge, New York. 152pp

Majid-Cooke F (2003) Maps and counter-maps: Globalised imaginings and local realities of Sarawak's plantation agriculture. Journal of Southeast Asian Studies 34 (2): 265-284

Maldonado S (2005) Perception and utilization of space in artisanal fishing communities. In: Diegues AC (ed) Tradition and social change in the coastal communities of Brazil, pp 58-63. NUPAUB, São Paulo. 207 pp

Malm T (2009) Women of the coral gardens: The significance of marine gathering in Tonga. Traditional Marine Resource Management and Knowledge Information Bulletin (25): 2-15

Mendoza JD (2000) The condition of indigenous knowledge (IK) from a structurationist perspective. First National Conference on Cordillera Research, Baguio City, Philippines, November 11, 2000

Netting R (1968) Introduction, Hill farmers of Nigeria: A cultural ecology of Kofyar of the Jos au. University of Washington Press, Seattle. 259 pp

Oso PA (2007) Transferability of knowledge in African indigenous herbal healing. In: Babawale T (ed) The Place of research and studies in the development of Africa and the African Diaspora, pp 185-229. Centre for Black and African Arts and Civilisation (CBAAC), Lagos. 386 pp

Posey DA (1985) Nature and Indigenous Guidelines for new Amazonian development strategies: Understanding biological diversity through ethnoecology. In: Hemming J (ed) Man's impact on forests and rivers: Change in the Amazon basin, pp. 156-81. Manchester University Press, Manchester. 232pp

Robbins P (2010) Red-spotted ox: A Pokot life. International Work Group for Indigenous Affairs, Copenhagen. 337 pp

Ruddle K (2000) Systems of knowledge: Dialogue, relationships and process. Environment, Development and Sustainability 2: 277-304

Sirait MT, Prasodjo S, Podger N, Flavelle A, Fox J (1994) Mapping customary land in East Kalimantan, Indonesia: A tool for forest management. Ambio 23: 411-417

Shilabukha DK (2000) The role of indigenous knowledge in the management of mangrove bio-diversity in Msambweni Division of Kwale District–Kenya. Unpublished MA Thesis, Institute of African Studies, University of Nairobi. 103 pp

Shilabukha K (2007) Indigenous knowledge, biodiversity, technology and economic values: Rethinking the link. In: Babawale T (ed) The Place of research and studies in the development of Africa and the African Diaspora, pp 171-184. Centre for Black and African Arts and Civilisation (CBAAC), Lagos. 386 pp

Steward JH (1958) Theory of culture change: The methodology of multi-linear evolution. University of Illinois Press, Chicago. 244 pp

UNICED (1987) Our common future: Report of the World Commission on Environment and Development. United Nations, New York. 300 pp

Wagner GP, da Silva A (2014) Pre-historic maritime and Brazilian shellmounts. Archaeological Discovery 2 (1): 1-5

Warren DM, Slikkerveer J, Brokensha D (eds) (1995) The cultural dimension of development: Indigenous knowledge systems. Intermediate Technology Publications, London. 582 pp

Wavey CR (1993) International Workshop on Indigenous Knowledge and Community-based Resource Management: Keynote Address. In: Inglis JT (ed) Traditional ecological knowledge: Concepts and cases, pp 11-16. International Program on Traditional Ecological Knowledge and International Development Research Centre, Ottawa, Ontario. 150 pp

Williams NM, Baines G (eds) (1993) Traditional ecological knowledge: Wisdom for sustainable development. Centre for Resource and Environmental Studies, National University of Australia, Canberra. 185 pp

Willis RG (1990) Introduction. In: Willis RG (ed) Signifying animals: Human meaning in the natural world, pp 1-24. Unwin Hyman, London. 258 pp

Zavarin E (1991) Comment on the medicinal value of tropical ecosystems. In: Kingsley D, Bernstan MS (eds) Resources environment and population: Present knowledge, future options, pp 252-253. Oxford University Press, New York. 440 pp