FMSP Project R8196: Understanding Fisheries Associated Livelihoods and the Constraints to their Development in Kenya and Tanzania

Annex 1.2: Understanding Fisheries Livelihoods and Constraints to their Development, Kenya & Tanzania

Review Of Marine Fisheries Resources for Kenya

Authors: Dr D. Malleret-King, Dr A. King, S. Mangubhai, J. Tunje, J. Muturi, E. Mueni and H. On'ganda

This document is an output from a project funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of the DFID.

Table of contents

List of tables, figures and maps

1. Introduction

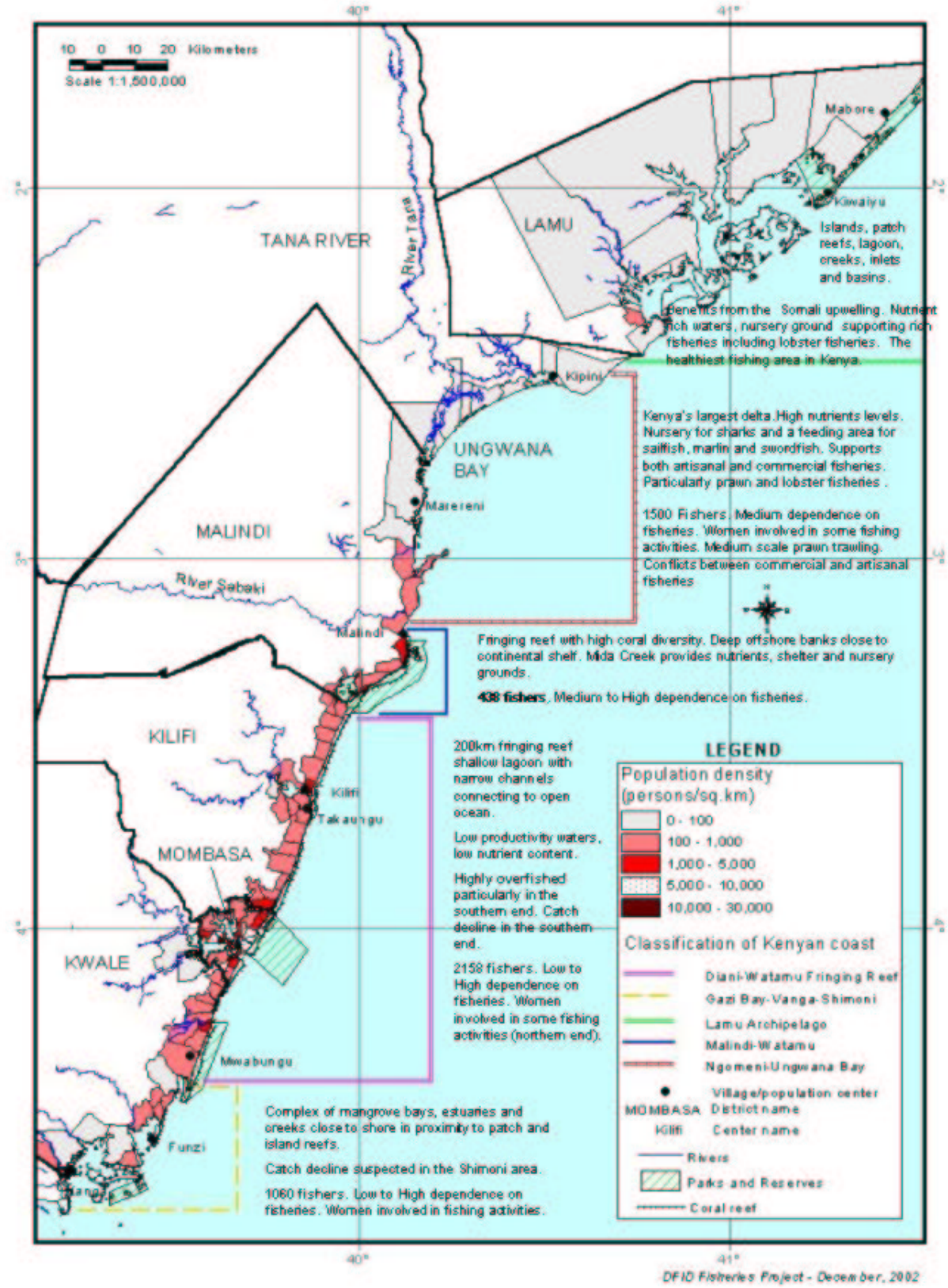
In Kenya, the marine fishery is predominantly small scale and artisanal. The marine catch is estimated to represent only 8.3% of the total fish catch of the country (Sanders *et al*, 1990), the rest coming from inland lakes and rivers, predominantly Lake Victoria. Due to this apparently low importance the marine fishery has historically received much less interest from the point of view of research and governance. This in turn has meant that reliable social, economic and scientific information is lacking.

However, the importance of the fishery lies more in its importance to coastal food security than total tonnage, although this is also likely to have been grossly underestimated. UNEP (1998) estimates that the marine fishery supports 35,000 people, however this study suggests that at least 60,000 people depend on fishing. The gaps in socio-economic information make it difficult to determine, at this stage, how important the fishery is in reality at the national level. It is however believed that its role in the coastal economy and subsistence of the poor is greatly underestimated.

The productivity of the Kenyan marine fishery is constrained by a number of biophysical factors including the narrow continental shelf, low productivity waters and seasonality. This, combined with increasing fishing pressure, has led to overexploitation in many areas.

Map 1 below summarises some of the main characteristics of the Kenyan fishery.

Map 1: Population distribution and ecological characteristics affecting fisheries productivity



1.1. Aims and Objectives of the review

The aim of this review is to compile existing socio-economic and biophysical information in order to have a better understanding of the structure of the fishery, its importance, its socio-economic context, and determine gaps in information.

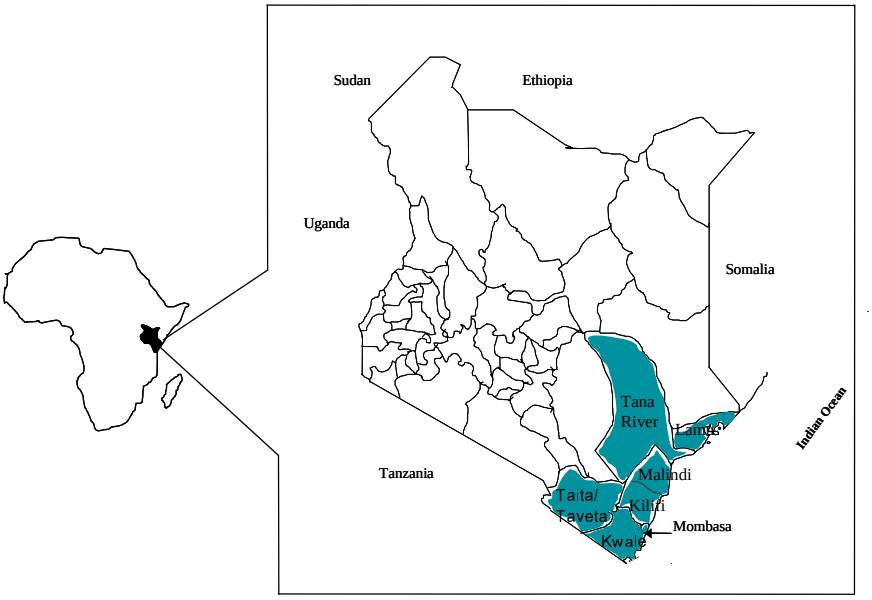
The objectives of the review were identified as follows:

- Identify and collate existing information using both literature and interviews (sub-activity 1.1)
- Categorise and quantify stakeholders and their dependency on fisheries resources (sub-activity 1.2).
- Categorise and quantify status, trends of and threats to fisheries resources (sub-activity 1.3).
- Describe the assets and access to capital of fisheries-dependent stakeholders (sub-activity 1.4).
- Conduct an institutional analysis of the fisheries sector (sub-activity 1.5).
- Identify information gaps (sub-activity 1.6).
- Inform selection of sites where field research will be carried out (sub-activity 2.2).

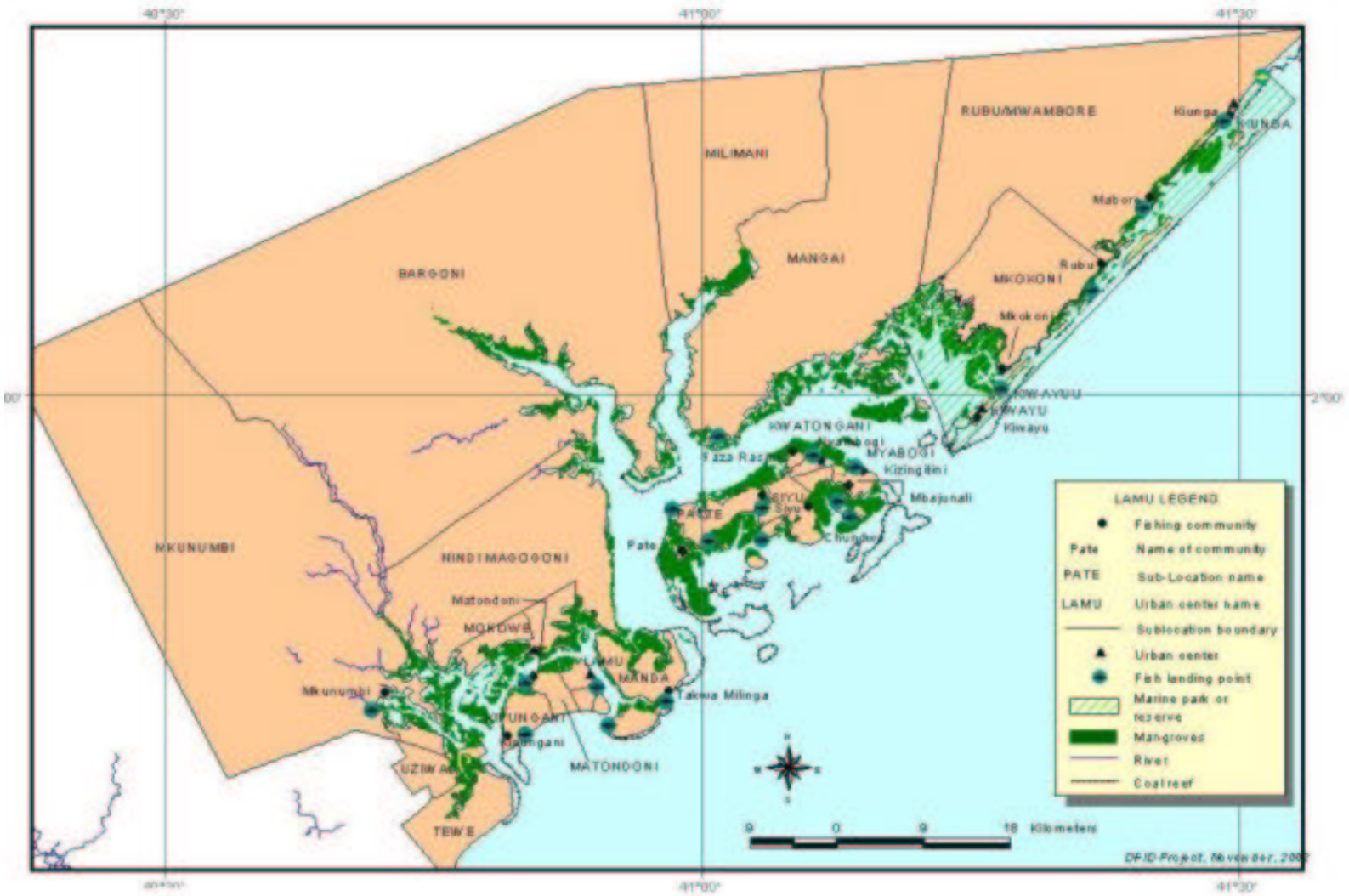
This review provides a general overview of the situation with regards to the role of fisheries in the livelihoods of the poor in coastal communities in Kenya, and identifies certain key issues, constraints and opportunities for livelihood improvement. A major constraint was the lack of information on the fishery and the lack of compiled information in the Fisheries Department and as a result a significant amount of primary information was gathered for the review through interviews. In addition to this overview, the project to which this review contributes has undertaken field studies to gather further information and verify some of these findings (see Annex 2 and Annex 3.1 and 3.2). A synthesis of the comparative analysis of this review and the fieldwork studies will draw conclusions on the potential for improved fisheries-based livelihoods in Kenya (Annex 4).

Most of the information available was compiled according to the administrative divisions of Kenya which are Provinces, Districts, locations and sub-locations. The Coast Province is divided into 7 Districts (Lamu, Tana, Malindi, Kilifi, Taita-Taveta, Mombasa and Kwale, refer to maps 1 above and maps 1a to 7 below). Taita Taveta is the only Coastal District which is land locked. Note that only Districts bordering the sea were taken into consideration in the review except when available data was aggregated at the Coast Province level.

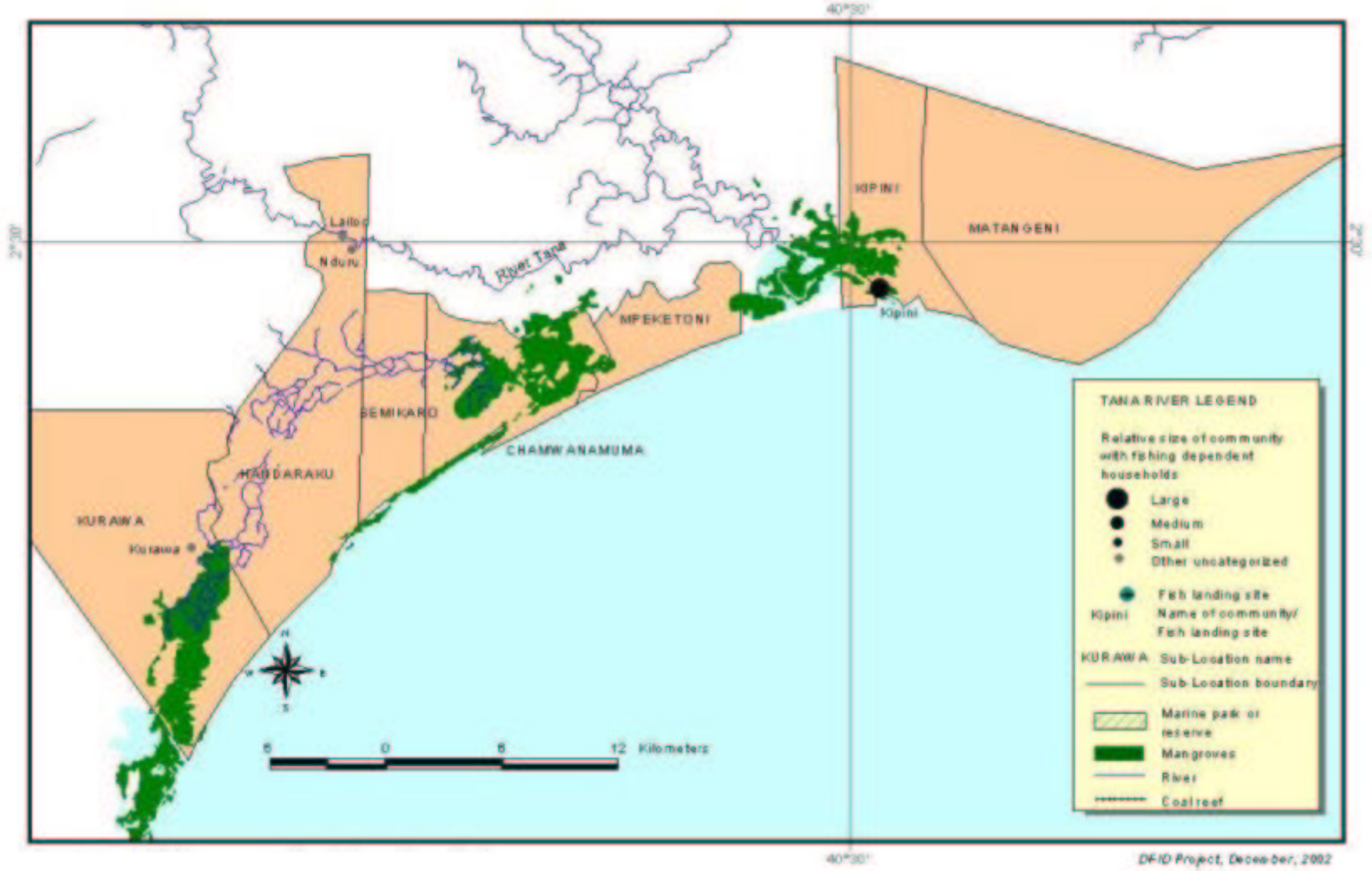
Map 1a: Kenya coastal Province (in green) and its districts



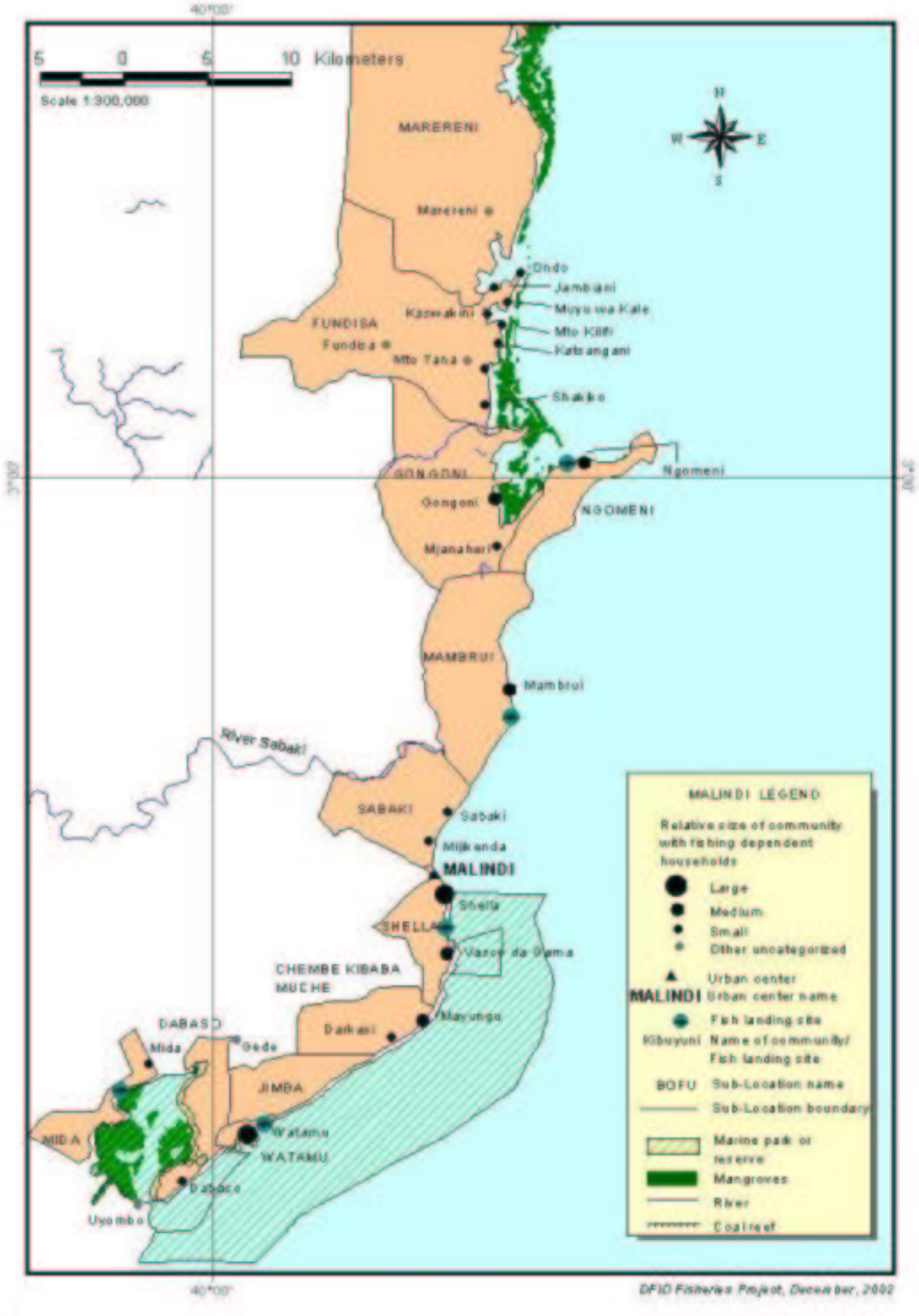
Map 2: Coastal communities involved in marine capture fisheries, Lamu District



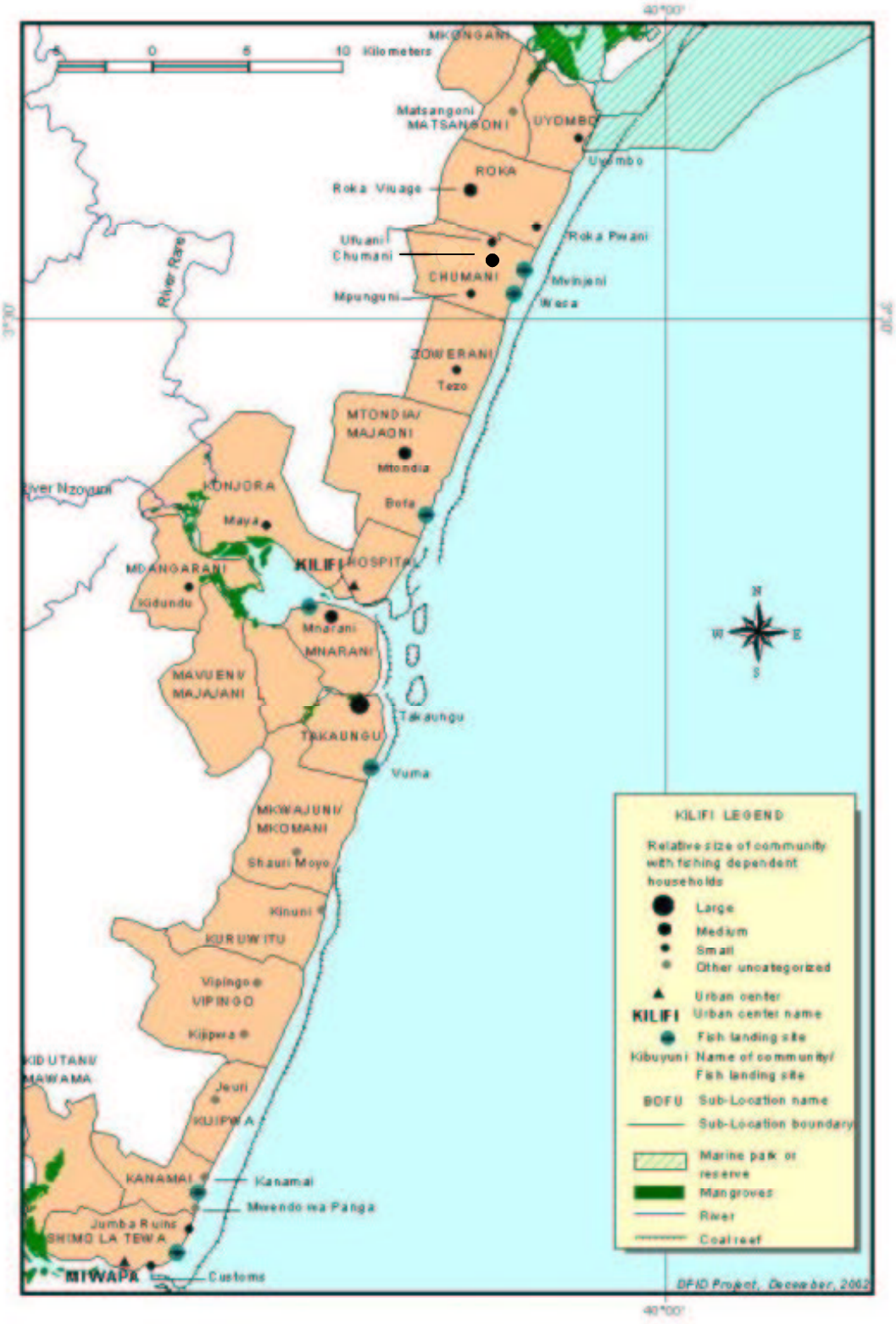
Map 3: Coastal communities involved in marine capture fisheries, Tana River District



Map 4: Coastal communities involved in marine capture fisheries, Malindi District

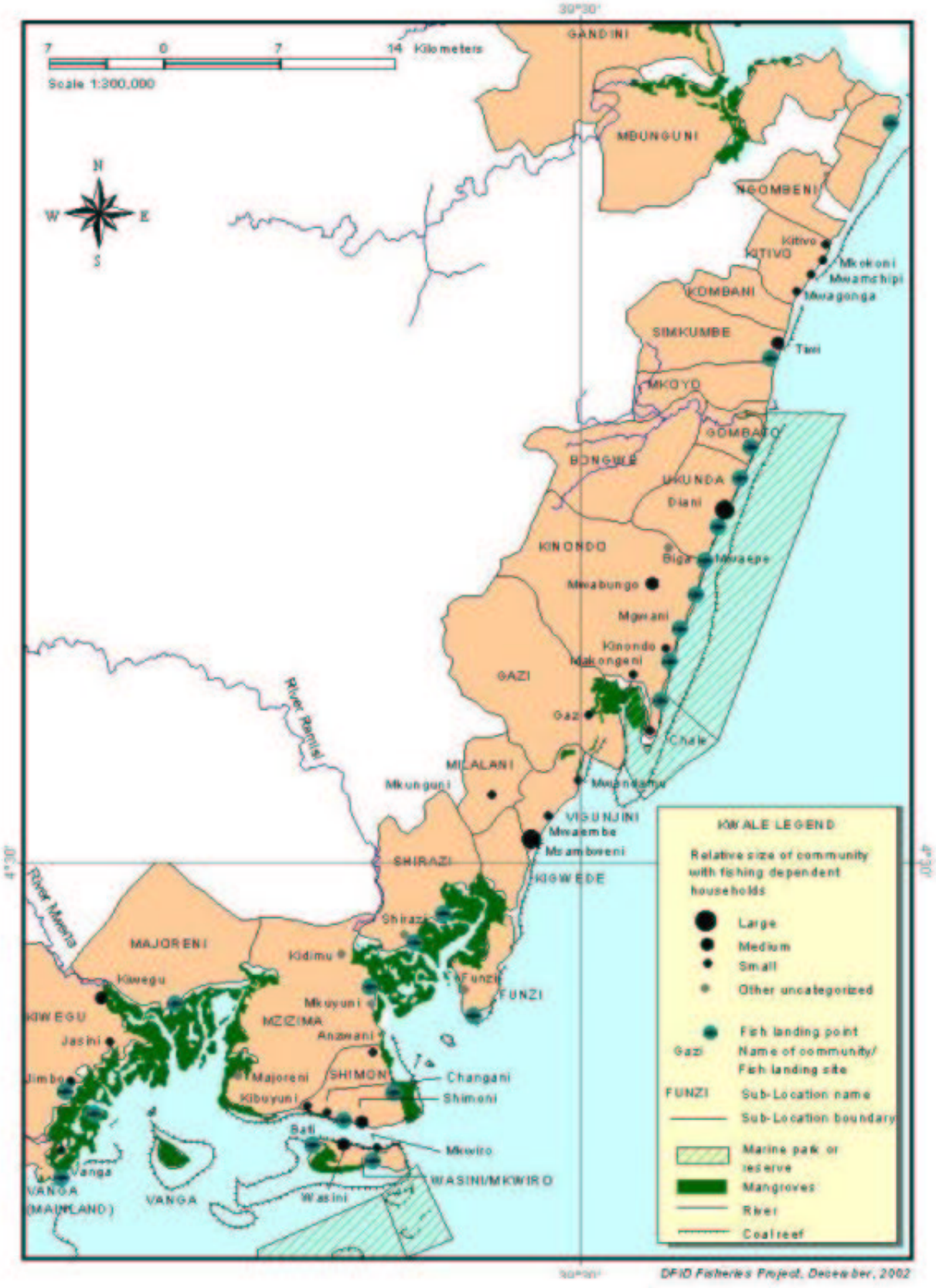


Map 5: Coastal communities involved in marine capture fisheries, Kilifi District



Map 6: Coastal communities involved in marine capture fisheries, Mombasa District

Map 7: Coastal communities involved in marine capture fisheries, Kwale District



1.2. Methodology

1.2.1. The Review team

Data collection to produce a review and profile of the Kenyan marine fisheries was carried out during September to November 2002 by a team of researchers from Kenya. The methods used to collect information were literature reviews and face-to-face interviews.

The team was composed of:

- Dr D. King and Dr. A. King, socio-economists, coordinators and leading consultants
- Mr J. Tunje, interviewer and independent socio-economist,
- Ms S. Mangubhai from MKK ltd, marine biologist, who assisted in the coordination of the interviews and in the compilation of information on biophysical characteristics of the Kenya coast,
- Mr J. Muturi from the Fisheries Department who worked as an interviewer and compiled information on both the fisheries characteristics in Mombasa and fisheries governance,
- Ms E. Mueni from the Fisheries Department who helped compile fisheries statistics,
- Mr H. On'ganda from the Kenya Marine and Fisheries Research Institute compiled maps of the coast using information collected by the team to complement existing information.

1.2.2. Literature review

A literature review was carried out to compile existing information on Kenyan marine fisheries status, characteristics, stakeholders and their socio-economic status as well as to compile information on the biophysical characteristics of the Kenyan coast. It was found that socio-economic literature on Kenyan marine fisheries tended to relate to specific projects and is therefore limited and patchy.

1.2.3. Interviews

Face to face interviews were carried out to complement and update information gathered through the literature review. This process sought to cover the whole of the Kenya coast, but due to logistical constraints the northern district of Lamu was not covered. Interview guides were used by the interviewers (see Appendix 1) to gather information on numbers of fishers, fisheries associated resource use patterns, fishers organisation, fisheries management, and dependence on fisheries. The information was collected mainly at the sub-location level and at the village level when possible.

Informants (see Table 1) were mainly from the Fisheries Department. When possible, fishers and fisher leaders were also interviewed.

The main interviewer travelled through the different coastal Districts (Kwale, Kilifi, Malindi and Tana River- see Map 1 section 4 and maps 3, 4, 5, 6, 7) interviewing informants in 13 different sub-locations. Another interviewer focused on the Mombasa District. Because of budget constraints and the difficulty of accessing Lamu District by road, it was decided to try and collect necessary information by other means (electronic interview with key informants working in the Lamu area). However, so far, no primary information has been obtained from Lamu.

Table 1: Background information on informants

	Type	Number	Percentage
Non Fisheries Department	Fishers/Leader Beach Management Committees	6	26
	Total Non FD	***6***	***26***
Fisheries Department	Fisheries Scout	8	35
	Fisheries Assistant	4	17.5
	Fisheries Officers	4	17.5
	District Fisheries Officers	1	4
	TOTAL FD	***17***	***73***
TOTAL		**23**	**100**

It is important to note that the information collected through interviews represents the informants' best knowledge. In the time available it was not possible to ground truth the information provided. Furthermore the information was collected mostly at the location or sub-location levels. It is realised that these levels of aggregation may be inappropriate for some of the parameters investigated, particularly to determine the dependence on fisheries resources at the local level (see section 3). However, the interviews provided a good overall understanding of the Kenyan artisanal fishery, and, in conjunction with the literature review, enabled identification of the main gaps in information.

1.2.4. Mapping

Maps were produced showing fishing villages, biophysical characteristics, Marine Protected Areas and administrative boundaries at the District level (Maps 2 to 7). This information did not exist in this form prior to the project. A more general map of the coast shows biophysical, demographic characteristics and division of the Kenyan Coast into larger ecosystems (Map 1).

1.3. Review structure

In section 2 the ecological and climatic context of the fisheries resources, trends in health/exploitation of these fisheries resources as well as threats to them are presented. Section 2 also presents a tentative typology of the Kenyan artisanal fishery according to the biophysical environment and resource uses.

Section 3 concentrates on the socio-economic characteristics of the Kenyan artisanal fishery, including aspects of poverty and access to capital. Section 4 examines the main aspects of fisheries resource governance in Kenya. Section 5 presents the results of the site selection process, which is detailed in Appendix 6. Section 6 concludes and draws out from the above sections the main constraints for fisheries dependent livelihood development and underlines gaps of information identified in the review.

2. Fisheries resources: ecological and climatic context, trends and threats.

2.1. Habitats, climatic diversity and fisheries resources

2.1.1. Coastal habitats and fisheries resources

Kenya, located in the tropics between the latitudes 1º41'S and 5º40'S has a narrow continental shelf with an estimated area of 19,120km^2 that stretches from its border with Tanzania to its border with Somalia. For the most part, the width of the shelf is narrow, less than 5km, though it extends almost 60km out to sea near the mouth of the Tana River (see maps 1 and 3) and in the North Kenya Banks (Lamu area). This restricts productive marine habitats close to shore and concentrates resource use activities along this area.

Different tropical marine and wetland habitats occur along the coast of Kenya including coral reefs, sea grass beds, mangroves and salt marshes (UNEP, 1998). A summary description of these habitats is given below:

a. Coral reefs

Coral diversity is high, 112 species of hard corals have been identified in Kenya and Tanzania (Sheppard, 1999) and 28 species of soft corals in Kenya (Samoilys, 1988). Kenya's coral reefs were severely impacted by the 1998 El Nino bleaching event, which resulted in the widespread bleaching and mortality of 50-90% of its reefs (Wilkinson, 1998; Obura, 1999).

The total area of Kenya's coral reefs has been estimated at 50,000ha (IUCN/UNEP, 1985). Kenya's coral reefs are divided into two main areas - a fairly continuous 200km fringing reef in the south extending from Malindi to Shimoni, and patch reefs (exposed and protected) and fore reef slopes in the north from Lamu to the Somali border (see maps 1 to 7). Both areas are interspersed with sand, seagrass and algae beds. The coral reefs and associated seagrass beds are the basis for a multispecies small-scale fishery along the entire length of the coast.

The southern reef forms a fringing reef crest broken up by creeks that drain coastal rivers, with a shallow lagoon along its length. The area is characterised by benthic productivity and low nutrient warm waters (McClanahan, 1988). The depth of the lagoon varies but does not exceed 7m, with some areas becoming inaccessible by canoes and boats during low tide. However, lagoon and fore-reef areas can be accessed in most weather conditions during both monsoon seasons, and hence are heavily utilised by fishers.

b. Mangrove forests

Mangroves are important wetland habitats that also support small-scale fisheries, either directly or as juvenile habitats for many food fish. There are twelve patches of mangrove forests along the Kenya coast, making up about 530 km^2 in total. The largest stands are found in the Lamu (Kiunga) archipelago, Vanga-Funzi and the Kilifi/Tana River area (map 1, 2, 3, 5, 7).

c. Sea grass beds

Twelve seagrass species are found in Kenya in intertidal and sublittoral environments on sandy and muddy substrates down to 15m, covering extensive areas of lagoons often in close proximity to patch or fringing coral reefs. Mida Creek and Gazi Bay have the most diverse and extensive beds along the coast of Kenya. Seagrasses play a variety of roles including the binding of sediments to prevent erosion, habitat and nursery areas for juvenile fish and invertebrates such as prawns, nutrients in the form of dead seagrass mats, and a source of food for green and hawksbill turtles, dugong and some fish species. Seagrass beds have been recognized for their importance in supporting local fisheries, particularly in relation to lethrinids (emperors), lutjanids (snappers), siganids (rabbitfish), scarids (parrotfish) and spiny lobsters (IUCN/UNEP, 1985).

d. Rocky shores & substrates

Kenya's rocky outcrops along the southern coastline and north of Lamu are limestone coral rock dating back to the Pleistocene (Obura, 2001). The macro-tidal diurnal cycle has a major influence on the settlement and zonation of intertidal communities (Brakel, 1980), which are heavily utilised by local fishers as a source of fish, invertebrates (e.g. octopus), and bait.

e. Sandy beaches & substrates

Kenya has an estimated 27,000ha of beach and dunes most of which are concentrated in the northern region (UNEP, 1998). Sandy beaches, dunes and substrates from Malindi to Lamu have formed from inputs of the Tana and Sabaki Rivers, with sands being pushed north and south during the SE and NE monsoons respectively (Brakel, 1984). Very little is known of bottom sand-dwelling communities but they are thought to support significant prawn and bottom-fish populations and associated fisheries (IUCN/UNEP, 1985).

f. Estuaries and wetlands

Two major perennial rivers influence habitats on the Kenyan coastline. These are Sabaki and the Tana Rivers, which form large, open sandy plains preventing the growth of corals. The Tana, Kenya's largest river, extends 950km inland with a catchment of 95,000km^2 and discharges freshwater and sediment annually into Ungwana Bay (see maps 1 and 3) in the order of 4000 million m^3 and 3 million tonnes respectively (UNEP, 1998). The 1300km^2 Tana delta is a complex of tidal creeks, floodplains, coastal lakes, mangrove swamps and seagrass beds, which is subject to frequent flooding and changes in the channels formed (UNEP, 1998). The Tana river provides high nutrients that flow over the North Kenya Banks at the convergence of the East African Coastal and Somali currents, and results in high productivity supporting seasonal migrations of pelagic fish (WWF, 2002). The Tana delta area and its surrounds support prawn and lobster fisheries.

Kenya's second largest river, the Sabaki is 650km long with a catchment of 70,000km^2, and discharges freshwater and sediment in the order of 2000 million m^3 and 2 million tonnes respectively into southern Ungwana Bay, north of Malindi (UNEP, 1998). Ungwana Bay is high in nutrients and provides a nursery for sharks and a feeding area for sailfish, marlin and swordfish and supports a high abundance of prawns (WWF, 2002).

A number of smaller rivers and creeks along Kenya's coast create specific habitats that support a diversity of local fisheries. These include the Ramisi, Mwachema Umba, and Mwena rivers discharging into Funzi-Shirazi Bay, Shimo la Tewa, Kilifi, Mombasa/Tudor, Mtwapa and Mida creeks.

g. Island ecosystems

Kenya has a number of offshore islands which are found at both the northern and southern ends of the country. Those in the south, Wasini and Kisite islands have fringing reefs lying 10km from the mainland, which support (with the exception of Kisite within the Kisite Marine National Park), local subsistence and commercial fisheries and tourism. Funzi island is also in the south but is close inshore and is linked to the mainland by mangrove forest. The islands in the north form the Lamu archipelago and include Lamu, Manda, Pate and Kiwaiyu (see Mps 1 and 2). These islands are dry, rugged and are exposed to rough sea conditions during the southeast monsoon, but provide sheltered lagoon areas supporting patchy but diverse coral communities and extensive areas which in turn support fish communities.

2.1.2. Seasonality, oceanography and fisheries

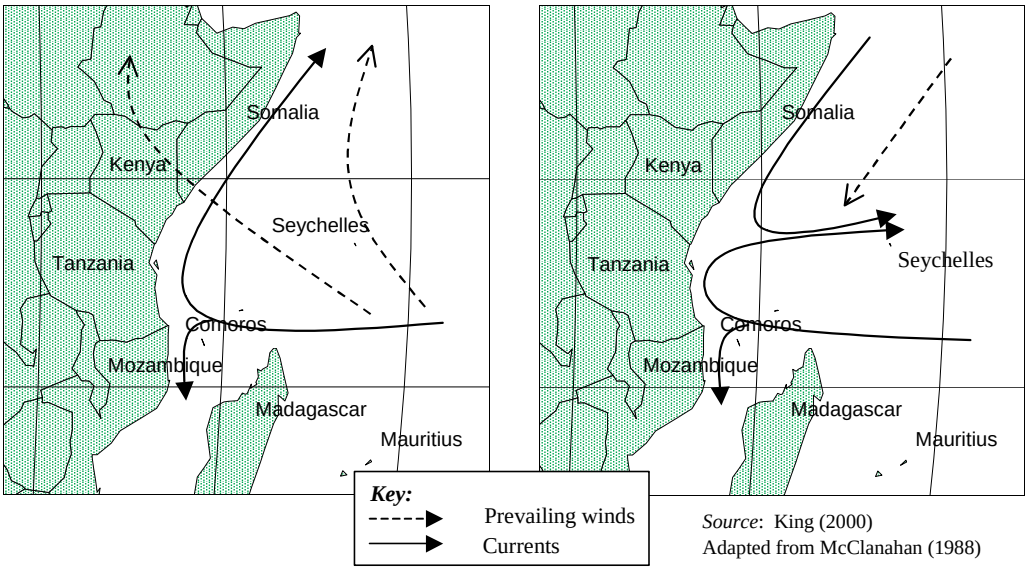
Weather conditions in Kenya are influenced by the Inter-Tropical Convergence Zone (ITCZ), a zone of low pressure which moves north and south of the equator according to the movement of the sun and influences the monsoon systems. The movements of the ITCZ conditions Kenya's dual season pattern characterised by the southeast (SE-*kusi*) and northeast (NE-*kaskazi*) monsoons which alter sea temperatures, rainfall, wind and sea conditions. The SE monsoon, from April to October, is characterized by cool temperatures (mean=26.4ºC, max=30ºC), long and heavy rains (55-272mm/month), rougher seas and strong winds (0.5-0.75m/s), while the NE Monsoon, from November to March and is characterized by warm temperatures (mean=28.4ºC, max=31-32ºC), short rains (8-84mm/month), calm seas and steady light winds (<0.25m/s) (UNEP, 1998; Obura, 2001).

The four oceanic currents influencing the physical and biological environment along the Kenya coast are the South Equatorial, East African Coastal, Equatorial Counter and Somali Currents. The South Equatorial Current transverses the Indian Ocean until it reaches the African coast (see Figure 1) and splits into the northerly East African Coastal Current and the southerly Mozambique current, running parallel to the coast. The East African Coastal Current always moves in a northward direction at least as far as Malindi.

However, during the NE monsoon, the East African Coast Current converges with the southward flowing colder upwelled waters of the Somali Current (1.5-2.0 knots) between Malindi and Lamu, and moves offshore forming the Equatorial Counter Current. During the SE monsoon the East African Coastal Current moves further north accelerated by trade winds and southerly winds and the Somali current reverses its direction of flow and increases its velocity to 2.0-2.5 knots, reducing the strength of the Equatorial Counter Current (Newell, 1957). The direction and strength of these major currents are likely to have a large influence on the dispersal and recruitment of species along the Kenya coast.

Figure 1: Seasonality of wind and current patterns in East Africa

a) SE monsoon b) NE monsoon



Source: King (2000)
Adapted from McClanahan (1988)

These seasonal patterns affect ecological processes as well as fisheries resource uses.

Kenyan waters, particularly on the southern coast have a low productivity. This is due to the fact that the East African coast is a downwelling area, this downwelling being stronger during the SE monsoon when the winds are strongest (Bell, 1972). Furthermore the southern coast is characterised by low nutrient contents (McClanahan, 1988).

The artisanal fish catch reduces during the SE monsoon, when winds are strongest and the conditions are often too rough for fishers to fish outside the sheltered waters of the lagoons (McClanahan, 1988, Rubens, 1996, Malleret-King 2000). Access to fishing grounds is therefore limited. The catch is likely to also be affected by the variation in oceanographic parameters triggering fish migration (Newell, 1957) or decreased fish density due to a deeper thermocline in the SE monsoon (McClanahan, 1988).

During the NE monsoon, fishing conditions are improved due to more favourable climatic conditions. Furthermore the southerly flow of upwelled nutrient-rich waters along the Somali coast results in high productivity in the water column and subsequent increases in fisheries yields (Kemp, 2000). Depending on the strength of this flow the Kenyan fisheries are affected positively by the high nutrient content of the water column, particularly on the northern coast. Fish are generally more abundant and larger in size in the Lamu Archipelago than other parts of the Kenya coast. This results partly from the influence of the Somali upwelling which increases the planktonic productivity and nutrient content of the waters in the area (McClanahan, 1988, D. Obura, pers. comm.) and partly because of the wider continental shelf and relatively low density of fishers.

2.1.3. Two biophysical regions

In terms of biophysical characteristics, Kenya's coastline can be divided into 2 main regions based on geological features :- Tanzania border-Malindi and Malindi-Somali border. Within these two regions, a number of key areas can be identified based on the distribution and inter-relationships between different habitats and their productivity (Table 2).

Table 2: Classification of the Kenya coast according to habitat complexes and biological productivity.

Areas	Type of Habitats	Fisheries and productivity	Proportion of the Coast (%)
Tanzania border-Malindi			
Gazi Bay-Vanga-Shimoni	Complex of mangrove bays, estuaries and creeks close to shore in proximity to patch and island reefs. Some of the largest mangrove trees are found in Gazi Bay.	Area supports local fisher communities. In the Vanga Shimoni area, easier access to deeper, more productive waters (Malleret-King, 2000).	10%
Diani-Watamu Fringing Reef	200km fringing reef with shallow lagoon with narrow channels connecting it with the open ocean.	The waters of southern Kenya and Tanzania are characterised by low nutrient contents (McClanahan, 1988). Overfished by local communities, particularly inshore areas, which can be accessed in both seasons.	30%
Malindi-Watamu	Fringing reef with high coral diversity running from Malindi-Watamu with deep offshore banks close to continental shelf. Mida Creek is a diverse groundwater-fed shallow mangrove and seagrass creek.	Nutrient rich Mida creek. Provide shelter and nursery grounds. Large sea grass beds. Part of a MPA.	5 %
Malindi-Somali border			
Ngomeni-Ungwana Bay	The area includes Tana, Kenya's largest delta with extensive channels, floodplains, coastal lakes, mangroves and wetland areas and the Sabaki River mouth. Wider continental shelf.	This area is rich in nutrients and supports both artisanal and commercial fisheries. Wider continental shelf. The Tana river provides high nutrients that flow over the North Kenya Banks at the convergence of the East African Coastal and Somali currents resulting in a highly productive environment. The delta and its surroundings support large prawn, shrimp and lobster fisheries. Ungwana Bay is high in nutrients and provides a nursery for sharks and a feeding area for sailfish, marlin and swordfish and supporting a high abundance of prawns (WWF, 2002).	20%
Lamu archipelago	System of barrier islands, patch reefs, lagoon, creeks, inlets and basins. Extensive mangrove forest, 160km^2 in pristine condition. Wider continental shelf.	Area has nutrient rich waters resulting from the Somali upwelling, and being in the convergence zone of the East African Coastal Current and Somali Current. Important nursery ground for crustaceans such as prawns and crayfish, and supporting a range of local finfish and lobster fisheries. Supports rich fisheries. (WWF, 2002). Fish are generally more abundant and larger in size in the Lamu Archipelago than other parts of the Kenya coast, resulting from lower exploitation pressures and the productivity of the area (D. Obura, pers. comm.).	35%

2.2. Fisheries resources and stakeholders

2.2.1. Resources exploited and potential

a. Main species exploited

The narrow continental shelf and low productivity waters constrain fishing activities. Most of the fishing is artisanal and small scale and carried out in near shore areas (between the shoreline and the reefs, Bakun *et al*. 1998). Furthermore, the fishery is based on a small number of species.

The main species caught along the coasts (see Table 3 below) are reef/sea grass/sand associated demersal fish species which constitute 38% of the catch according to UNEP (1998). The most commonly caught demersal species are parrot fish (Scaridae), Scavengers (including Lethrinidae, Lutjanidae and Haemulidae) and rabbit fish (Siganidae) (UNEP, 1998, Malleret-King, 2000, McClanahan and Mangi, 2001, see also Appendix 4**)**

Pelagic fish caught along the coast include, King fish, jacks and tuna, but account for less volume than demersal fish landed (UNEP 1998). Shark and rays are also exploited.

Crustaceans exploited include crabs (widely caught in mangrove areas and beaches along the coast), prawns (caught mainly in Mida, Kilifi Creek and Ramisis river estuary on a small scale and on a larger scale in Ungwana Bay where trawlers operate) and spiny rock lobsters, which are exploited commercially in the Lamu Districts (UNEP 1998).

Finally octopus has recently become an important fishery; it is widely exploited both on the north and south coast along with sea cucumbers and squid (UNEP, 1998, Malleret-King 1996, McClanahan and Mangi 2001).

The fisheries statistics (see Appendix 4) confirm the findings of various studies, a large part of the catch being composed of scavengers/snappers, rabbit fish, parrot fish, mixed demersals. Prawns, mixed others pelagics, beche de mer, octopus and squids.

b. Potential of marine fisheries

Quantitative information on fisheries resources come mainly from catch landed. Information from different studies, outlined below give an unclear picture of the status and potential of marine fisheries. Little is known about the potential of offshore fisheries, for example, to reduce pressure on the inshore fisheries. The 1997 to 2001 National development plan (Fisheries sector) estimated the coastal marine fisheries in the EEZ for tuna and tuna like species at 200,000MT, although more recent suggestions are 100,000 MT and 140,000MT for highly migratory species (Habib, 2002 unpublished). However Iversen (1994) estimated production beyond the reef at 5000 to 8000 MT, a large part of was believed of little commercial value. The potential trawl estimated by Professor Mesyatsev was around 9800 MT for an area of 20500 sqKm, the most important trawling zone being Ungwana (see Table 3).

Table 3: Trawl potentials per area
(source: trawl surveys by Prof Mesyatsev in the mid 1970s sourced through Fisheries Department)

Zone	Area (Sq. Km)	Potential yield (MT)
Lamu	3531	1700
Ungwana	10942	5200
Mid-coast (malindi, kilifi, mombasa)	3618	1800
South coast	2420	990
Total	20500	9790

Fisheries department estimates the total marine potential at 350,000MT per year, including highly migratory species, yet FAO (1990) estimated the potential annual marine catch at 20,000 MT with the reef fisheries at 12 000 MT.

Other information is now being collected by KMFRI and the Fisheries Department on the Ungwana Bay prawn fishery looking at the effect of trawling on local small scale fisheries and the ecology of the bay (Muturi *pers. comm*.), which should give a more accurate indication of the status of the fishery in the bay.

2.2.2. Number of Fishers and other fisheries stakeholders

By law fishers have to register with the Fisheries Department every year, which enables the Department to keep some record of the numbers of fishers operating. However records are known to be inaccurate due to the inaccessibility of many sites, the limited resources of the Fisheries Department and because many fishers do not register (Malleret-King, 2000). Furthermore the information available at the Fisheries Department is aggregated at the District level and therefore for the purposes of this review, to select a study site, needed to be collected from the locations visited during the review process.

Table 4: Number of fishers registered or estimated per sub-location (2002) and percentage it represents of the male population of the sub-locations considered
(source: census 1999 and this study)

District	Location	Sub-location	Number of registered fishers (other data in brackets)	Male population	% of male population fishing
Lamu	-	-	-		
Tana	Tana River	Kipini	290 (400 estimated this study)	**1867**	**21.4**
Malindi	Fundisa	Fundisa	500	3349	14.9
	Gongoni	Gongoni	625	13438	
		Ngomeni			
	Magarini	Mambrui			4.7
	Malindi	Sabaki	203	21321	
		Shella			1.0

	Watamu	Watamu	235	9729	
	Gede	Dabaso			
		Mida			2.4
		Total Malindi	**1563**	**47837**	**3.3**
Kilifi	Matsangoni	Uyombo	100	1900	5.3
	Tezo	Mtondia/ Majaoni	450	4784	9.4
	Kauma	Mdangarani	70	452	15.5
	Kilifi Township	Sokoni	70	3248	2.2
	Kilifi Township	Mnarani	50	3152	1.6
	Takaungu/ Mavueni	Takaungu	400	2698	14.8
	Mtwapa	Shimo la Tewa	120	14339	0.8
		Total Kilifi	**1260**	**30573**	**4.1**
Mombasa		Bamburi	140	5871	2.4
		Likoni	150	33462	0.4
		Mikindani	220	10954	2.0
		Junda	35	26805	0.1
		Port Reitz	48	30252	0.2
		Island (Old Port)/kizingo	30	11099	0.3
		Total Mombasa	**623**	**118443**	**0.5**
Kwale	Tiwi	Simkumbe	25	4651	0.5
	Waa	Kitivo	50	2285	2.2
	Diani	Ukunda	100 (211 Rubens, 1996)	12956	0.8
	Kinondo	Kinondo	150 (329 identified by CORDIO 2003)	6885	2.2
		Gazi	60	1960	3.1
	Msambweni	Vingujini	300	6898	
		Milalani			4.3
	Pongwe & Kidimu	Shimoni	400	1890	
		Wasini-Mkwiro			21.2
	Vanga	Vanga	300	3516	
		Kiwegu			8.5
		Total Kwale	**1385**	**41041**	**3.5**
		TOTAL	**5231**	**239761**	**2.2**

Estimates of the number of fishers for the coast vary from 5,000, of which 4,000 are artisanal (UNEP, 1998) to 12,000 fishers (Ministry of Tourism and Wildlife 1989). The number of fishers estimated from the figures in Table 4 are 5231 for 5 of the 6 coastal Districts investigated. Information is missing for the Lamu District which is an important fishing District, so the total number of fishers would be higher than 5,231. Furthermore, it is known that a large number of fishers do not register with the Fisheries Department (Malleret-King, 2000), as indicated by specific studies indicated in the table in brackets. The figure of 12,000 estimated by Ministry of Tourism and Wildlife (Fisheries Department is within this ministry) is consider too high by Glaesel (1997), but it might be an attempt to include part time, occasional and sports fishers. A more reliable figure could be 6,000 (Sanders *et al*., 1990) and 8,000 (McClanahan and Obura, 1995) but these figures are likely to have changed since they were published.

According to UNEP (1998), the number of dependents per fisher is 7, while it was found in Diani that the number of dependents per fisher was on average 5 (Malleret-King, 1996). Thus the number of people depending directly on fishing could vary between 25,000 and 56,000. These figures exclude fish traders and their dependents. 1000 more people could be involved in fish selling and processing (Obura, 1999), thus 5,000 to 7,000 dependents more. The total figure of people depending on the fishery could be as high as 30,000 to 63,000 individuals on the coast.

According to Table 4, which excludes Lamu, Kilifi would be the District with the highest percentage of fishers in relation to Kilifi District coastal sub-locations' male population. Locations such as Pongwe Kidimu, Vanga and sub-locations such as Takaungu, Mdangarani, Mtondia/Majaoni, Fundisa and Kipini have a relatively high percentage of the male population fishing (between 8% and 21%).

2.3. Gear, vessels and fishing use patterns

The marine fishery in Kenya is predominantly small scale and artisanal (UNEP, 19980). Only 10% of fishing vessels were estimated to be motorised (UNEP, 1998) and the main fishing fleet is composed of non-motorised dug out canoes, outrigger canoes and dhows (UNEP, 1998). The fishery is not capital intensive except for the medium scale, commercial prawn fishery in Ungwana Bay which represents less than 10 small and medium sized trawlers. The most widely used gears along the coast are those that are less capital intensive. It was found in previous research that one of the most important criteria along with time and energy factors for gear selection are the economic constraints (see section 3).

2.3.1. Main gears used

The gear used still includes traditional gear such as handmade split cane traps, tidal weirs, handlines sticks and spears. However, nets are becoming widespread, mainly gill nets. Spear guns (home made) have also been widely adopted along the Kenyan coast. The choice of gear is often an economic choice (see section 3).

a. Gear description

Traps (referred to as traditional fish traps): vary from 50 cm up to 2 metres width (Glaesel, 1997). They are hexagonal with a funnel entrance (from 15 to 20 cm in diameter) and are hand made from palm fronds or other pliable woods (Glaesel, 1997, Malleret-King, 2000). They are weighted with stones and rest on the seabed over night; they are recovered at low tide. Fishers check from above with a mask and if full, the traps are hooked or lifted inside the boat. Smaller traps are used in shallow areas whereas larger ones are laid near breaks in the reefs at depths up to 30 m (Glaesel, 1997).

Handlines have been used for centuries in Kenya (Glaesel, 1997). They are used from boats and also from the shore. When used nearshore, small demersal reef fish are mostly targeted and when used offshore from larger boats with heavier twine, larger pelagic fish species (e.g. kingfish, large jacks, tuna) are caught. Offshore, trolling and set bottom lines are occasionally used. The use of lines can be very strenuous thus elderly people rarely use them offshore where large fish can be caught.

Tidal weirs or fence traps are located perpendicular to the shore, with the arrowhead pointing towards the sea. Small tightly placed posts tied together with woven doum or dwarf palm fronds are attached to widely spaced structural posts (about 2 metres high) (Glaesel, 1997). When the tide goes out, fish are channelled along the wall of posts into the end of the structure where a net is located. At low tide, the fishers scoop the fish up. This method can be used by fishers of all ages.

Spears and sticks are home made and mainly used to catch octopus. They are used by men and women poking into cracks and holes in the reefs at low tide. Most fishers catch octopus, particularly elder fishers as it is one of the least strenuous fishing methods. Moreover, this type of fishing does not require the use of a boat (although it is done on a larger scale with a boat) or other capital items. The traditional long spear is also used to spear fish, but is rapidly being replaced by the spear gun.

Nets are relatively recent and were introduced in Kenya at the beginning of the 20th century (Glaesel, 1997). In the main they require the use of boats. More recent changes have included the shift from cotton nets to nylon nets. The types of nets used depend on the location of the activities, the target species, the season, and the type of boats available. Gillnets are the most wide spread along the coast, and these are left overnight offshore (mesh size from 15 cm to 18 cm, Glaesel, 1997). Younger and middle aged fishers use nets as they are considered one of the more strenuous methods by elder fishers due to the potential load.

Other net types include: *Simu* nets, which are very small meshed nets used nearshore to catch seasonal sardine like species; and cast nets, which are used in sheltered areas and creeks to catch small fish and prawns.

More recently introduced and now banned on the coast of Kenya (although still widely in use) are beach seines. These are small mesh size nets up to 100 meters in length set in the lagoon and pulled back to the beach or onto the reef crest. They are usually used by migrant/settled migrant fishers. Beach seiners are younger fishers due to the load. Due to the destructive effects of these nets, in some locations such as in the South Coast and some sites in the North coast, this method of fishing has been rejected by local fishermen in the last few years.

Spear guns: they are hand made, used with masks and fins. They do not require the use of a boat and are widely used, particularly among the younger fishers. This fishing method is now banned in Kenya, however the law is not enforced yet.

b. Gear distribution and implications of potential law enforcement

There is no information available at the national level on the gear distribution and or catch distribution per gear. However, some information can be derived from research carried out on the south coast. McClanahan *et al* (1996) found that in Diani (see Map 7), spear guns and beach seines were the most widely used (respectively 39.3% and 25.9% of the fishers using them). The research also found that out of the five gears used at the sites investigated these two gears totalled nearly 80% of the catch. More recent studies in the same area show that spear guns and beach seines are still the most widespread gear (46.2 and 24.3% of fishers, Wanyonyi et al. 2003) but only totalling 41% of the catch (Obura, 2000). The main difference between the two studies relates to the use of gillnets, Wanyonyi et al. (2003) found 21.3% fishers using them than whereas McClanahan *et al*. (1996) found only 5.8%. A change may have taken place in the intervening period, but the reasons are unknown. The

relative use of other gear is comparable in both studies (traps and lines). Further south, in the Shimoni area traps and lines are the gears mostly used (Malleret-King, 2000).

As mentioned in the previous section, beach seines have been prohibited for a few years and spear guns have now become illegal. However the law is not effectively enforced, beach seines are still used except in a few areas (e.g. Galu due to enforcement by local fishers themselves) and no attempt has been made to forbid spear gun fishers to stop their activity as yet. The ban of both these gears will have a major effect on the fishing population, particularly young fishers. Not only the studies mentioned above suggest that they are the main gear used (at least in the south coast of Kenya) but these gears are also the easiest gear to use for young fishers who lack capital to take up other methods where boats and/or expensive materials are necessary.

Reasons for banning beach seines are clear. They are one of the most destructive gears used in Kenya and their use threatens the sustainability of fisheries resources (see section 2.5). The small meshed nets catch everything indiscriminately in lagoons including juveniles and studies have shown their negative impacts on the resource base (Rubens, 1996; McClanahan and Mangi, 2001; Mwaura *et al*. 2001; see section 2.5.1).

Reasons for banning spear guns are less clear. Rubens (1996) found that reasons included lack of hygiene (the fish is pierced with a rusty piece of metal), wastefulness (suggestion that a high proportion of hit fish are not recovered), effectiveness (it was considered to be too effective a fishing method). According to Rubens (1996) however this did not reflect reality, especially in terms of effectiveness. He found that spear guns was the least effective gear in Diani (a spear gun fisher averaged 3.67 Kg of fish per day compared to 4.09 Kg for trap fishers, 4.7 Kg for hand line fishers, 5.53 Kg for beach seine fishers and 6.47 Kg for gill net fishers).

Spear guns account for the majority of fishers on the south coast. Thus the benefits of banning spear gunning would be to release pressure on the overexploited inshore fishery. However as Rubens (1996) notes, this benefit would only exist if spear gun fishers would enter the offshore fishery. Spear gun fishers are the younger and the poorer fishers (Malleret-King 1996) and their transfer, without subsidies, to offshore fishing for which boats are required, would be unlikely.

If beach seine and spear gun fishers were to be reallocated to the traditional fishery, a loss would be incurred by the reef fishery. Indeed, investigating the catch composition per gear type, Rubens found that pelagic catch such as baracudinas and wolf mackerel, and diverse reef fish caught by spear guns, were not targeted by the traditional gears. Although the loss would be mitigated by potential recovery from the ban of seine nets, the fisheries diversity would be decreased.

Banning beach seines and spear guns would thus affect a large number of fishers, who might be in a vulnerable position already. Although the benefits of banning beach seines are obvious, the benefits of banning spear guns are not as clear. It is unlikely however that these bans can be enforced if no alternatives are given to the fishers (Muturi, *pers. comm*.).

2.3.2. Boats

Along the Kenyan coast the most commonly used boats are dug out and outrigger canoes, these are poled or sailed. Larger sailing boats are also used particularly for longer

campaigns (net fishing). Dhows are used particularly on the northern area of the Kenya coast where waters are more productive and offshore waters easily accessed. Few fishers use engine powered boats.

The total number of boats was estimated to be 4000 by the Ministry of Tourism and Wildlife (1989). Information on the total number of powered boats is not collected by the Fisheries Department, information on larger sailing vessels and powered boats is aggregated. However these statistics indicate that such vessels are only present in Kwale district (30 identified and only 6 were known to be motorised based on King (2000) and Malleret-King (2000) in the District) and the Lamu District (number unknown) (Muturi, *pers. comm*.). Malleret King (2000) found that less than 10% of the fishing boats in the Shimoni area were motorised, which compares to the UNEP (1998) figure of 10%.

Boats are expensive and fishers often rent them or share them between two or three people. In the Shimoni area, less than 40% of the fishers owned a boat (Malleret-King, 2000).

2.3.3. Fishing use patterns typology

The biophysical characteristics of the coast affect fisheries productivity and characteristics. The following typology of the Kenyan fishery is based on the biophysical division of the coast. Demographic characteristics and use patterns, the role of women and the relative dependence (see section 3) on fisheries resources are also taken into consideration. The information is based on: existing literature (biophysical characteristics, see section 2.1, population census 1999 -see Table 4, information on Lamu) and interviews at the sub-location level (gear, numbers of fishers, species targeted, dependence-table 3.1 and 3.2-, women and fishing).

Lamu archipelago : 35 % of the Kenyan coastline approximately

Characteristics of the environment: System of barrier islands, patch reefs, lagoon, creeks, inlets and basins. Extensive mangrove forest, 160km^2 in pristine condition. The Lamu archipelago is located at the convergence zone of the Somali and East African currents and benefits from the Somali upwelling. Thus Lamu waters are rich in nutrients which makes them support one of the richest fisheries on the coast of Kenya. Important nursery ground for crustaceans such as prawns and crayfish, and supporting a range of local finfish and lobster fisheries. (WWF, 2002). The following information is based on (Obura et al., 1998). The study was carried out in Kiunga thus only in the northern end of the District. (see map 2)

Demography	**Number of fishers**	**Species exploited**	**Gear**	**Vessels**	**Fishing areas**	**Dependence**	**Women and fishing**
The District and coastal sub-locations are very scarcely populated. All of the sub locations have a density of 0-100 p/sq.km Except for Lamu/Matondoni/ Kipungoni (urban) which have a density of 100-1000 p/sq.km	No information obtained.	**Reef/seagrass associated fish:** grunter, parrotfish, emperors, rabbit fish, snappers. Groupers (mainly dry season) **Pelagic**: king fish, rays and sharks (mainly dry season) **Crustaceans**: lobsters (mainly dry season).	**Nets** (Gillnets, beach seines) Driftnets (mainly dry season) **Lines** (hand lines, longlines) **Spearguns** (not widely) **Spear and sticks**	Boats mentioned: Dugout, mashua	Inshore , lagoons, Offshore- outer reefs, deeper waters (in dry season mainly)	No information	Women involved in shell collection.

The Ngomeni-Ungwana Bay system: 20% of the Kenyan coastline approximately

The area includes Tana, Kenya's largest delta with extensive channels, floodplains, coastal lakes, mangroves and wetland areas and the Sabaki River mouth. This area is rich in nutrients supports both artisanal and commercial fisheries. The Tana river provides high nutrients that flow over the North Kenya Banks at the convergence of the East African Coastal and Somali currents resulting in a highly productive environment. The delta and its surroundings support large prawn, shrimp and lobster fisheries. Ungwana Bay is high in nutrients and provides a nursery for sharks and a feeding area for sailfish, marlin and swordfish and supporting a high abundance of shrimps (WWF, 2002).

Districts: Tana River and Malindi. Sub locations: Kipini, Fundisa, Gongoni, Ngomeni and Mambrui. (see map 3 and 4)

Demography	**Number of fishers**	**Species exploited**	**Gear**	**Vessels**	**Fishing areas**	**Dependence**	**Women and fishing**
Area not densely populated 25% sub locations with population density of 100-1000 p/sq.km 75% less than 100 p/sq.km Between 3000 (Kipini) and 11000 (Gongoni) inhabitants	1500 fishers estimated 8% of the male population (18654) involved in fishing	**Estuary:** catfish, **Reef/seagrass/sand associated :** grunter, parrotfish, black skin, rabbit fish, mullet **Pelagic**: Streaker, jacks, Barracuda, Ribbonfish, queenfish, king fish, Small mackerel, sharks **Large pelagics/deep sea**: sailfish, blackmarlin **Crustaceans**: prawns, lobster, crabs	**Nets** (Gillnets, Driftnets/shark nets, Seine nets, cast nets) **Lines** (longlines, hand lines) **Traps:** river traps and lobster pots. **Spearguns** **Trawls**	Boats mainly used are: **dugout canoes** and **mashua**/dhows. A few **motorised boats** particularly on the Tana Delta and in the southern end of the area Ungwana Bay, 5 **prawn trawlers** operate.	Tana Delta, in the river mouth and inshore during the rainy season. Reef areas. Offshore on the Southern side of the area and in deep waters during the dry season.	**Medium** dependence on fishing. **Fishing** related activities and **farming** are the main activities in the area. Tourism occurs but was considered as the least important activities.	Women fish for prawns throughout the area. Fish octopus/sea cucumber in the southern end. Women involved in fish trading (fried fish) and food selling to the fishers.

Malindi-Watamu stretch: 5% of the Kenyan coastline approximately							
Fringing reef with high coral diversity running from Malindi-Watamu. Deep offshore banks close to continental shelf. Mida Creek is a diverse groundwater-fed shallow mangrove and seagrass creek provides nutrients, shelter and nursery grounds. Districts: Malindi Sub-Locations: Sabaki, Shella, Darkasi, Jimba, Watamu, Dabaso, Mida (information was obtained for 6 of the sub-locations)-see map 5							
Demography	**Number of fishers**	**Species exploited**	**Gear**	**Vessels**	**Fishing areas**	**Dependence**	**Women and fishing**
Populated area: between 4,900 inhabitants (Mida) and 29,000 (Shella). 30% sub locations with density population 1000-5000 p/sq.km 70% between 100 and 1000 p/sq.km	438 fishers estimated 1.4% of the male population (31050) involved in fishing	**Estuary fish:** catfish **Reef/seagrass assoc-iated fish:** grunter, pouter, parrotfish, black skin, rabbit fish, snappers, goatfish, groupers **Pelagic**: jacks, Barracuda, queenfish, king fish, small mackerel **Crustaceans**: lobster (dry season)	**Nets** (Gillnets, Driftnets/shark nets, seine nets) **Lines** (hand lines) **Traps:** traditional fish traps Lobster pots (dry season)	Boats mainly used are: **dugouts**, a number, **mashua**dhows. **motorised boats**.	Inshore (in lagoon and in Sabaki creek) Offshore/deep sea (in dry season mainly)	**Medium to High**	Women involved in fish trading (fried fish) and selling food to fishers.

Diani-Watamu stretch: 30 % of the Kenyan coastline approximately

200km fringing reef with shallow lagoon with narrow channels connecting it with the open ocean. Low productivity waters, low nutrient content. Very overfished particularly in the southern end of the area. Catch decline in the southern end.

Districts: Kilifi, Mombasa and Kwale Sub-Locations: Uyombo, Roka, Chumani, Mtondia/Majaoni, Sokoni, Mdangarani, Mnarani, Takaungu, Shimo La Tewa, Mombasa sub-locations, Kitivo, Simkumbe, Ukunda, Kinondo. (Information was obtained for 18 of the sub locations)- See maps 6 and 7

Demography	**Number of fishers**	**Species exploited**	**Gear**	**Vessels**	**Fishing areas**	**Dependence**	**Women and fishing**
Populated area: between 948 inhabitants (Mdangarani) and 59,000 (Likoni/Mombasa). Majority of sub locations with density population 100 to 1000 p/sq.km outside Mombasa with 1000-5000 for Kilifi sokoni and Diani. In Mombasa 1000-30000 p/sq.km	2158 fishers estimated 1.2% of the male population 9 175793) involved in fishing	**Estuary fish:** catfish, eels **Reef/seagrass associated fish:** grunter, pouter, parrotfish, black skin, rabbit fish, snappers, goatfish, groupers (mainly in dry season) **Pelagic**: jacks, sardines, ribbonfish, Barracuda, queenfish, king fish, small mackerel, bonito, sailfish (1 area, dry season) **Crustaceans**: lobster (few areas), prawn (in creeks), crabs. **Octopus** and **squid** (widely)	**Nets** (Gillnets, beach seines mainly) Cast nets: in creeks (Mdangarani and Mombasa-Port Reitz Junda, Birikani) Driftnets (dry season only)- mentioned in 1 sub-location. **Lines** (hand lines, longlines) **Traps:** traditional fish traps , tidal weirs Lobster pots, prawn traps - few areas **Sticks** **Spearguns**	Boats mainly used are: **dugouts**, a number and **outriggered** canoes (particularly in the southern end). **Mashua/**dhows. (only 1 mention out of 18 sub-locations) **motorised boats** very few (appear in 20% of sub-locations we got information from).	Inshore , lagoons, creeks, shallow waters, sea grass beds Offshore-deeper waters (in dry season mainly)	**Low to high** Fishing is an important activity is the stretch however some urban areas will have a multiplicity of activities and in the southern end particularly Ukunda tourism is an important activity. Difficult to aggregate for the whole area.	Women mainly involved in fish trading (fried fish) and food selling to fishers. Around Kilifi creek also involved in fishing prawns.

Vanga-Shimoni-Gazi stretch: 10 % of the Kenyan coastline approximately							
Complex of mangrove bays, estuaries and creeks close to shore in proximity to patch and island reefs. Catch decline suspected in the Shimoni area. District: Kwale Sub-locations: Gazi, Vingunjini, Milalani, Shimoni, Wasini/Mkwiro, Kiwegu, Vanga. (see map 7)							
Demography	**Number of fishers**	**Species exploited**	**Gear**	**Vessels**	**Fishing areas**	**Dependence**	**Women and fishing**
Area not densely populated: between 1,100 inhabitants (Wasini/Mkwiro) and 10,000 (Vigunjini). Approximately half of the area has a density population 0-100 p/sq.km and half between 100 and 1000 p/sq.km	1060 fishers estimated 13.4% of the male population (14264) involved in fishing	**Reef/seagrass associated fish:** grunter, pouter, parrotfish, black skin, rabbit fish, snappers, goatfish, groupers (mainly in dry season), unicorn fish **Pelagic**: jacks, sardines, ribbonfish, Barracuda, queenfish, king fish, small mackerel, bonito, rays, sharks (rays and sharks: Vanga/Kiwegu) **Crustaceans**: prawns, crabs. **Octopus**, **squid, seas cucumber**.	**Nets** (Gillnets, beach seines, cast nets) Driftnets (not widely- Kiwegu/Vanga) **Lines** (hand lines,) **Traps:** traditional fish traps , tidal weirs Crab pots, **Spearguns** (not widely) **Spear and sticks (**for octopus- Malleret-King, 2000**)**	Boats used throughout the area: **dugouts**, a number and **outriggered** canoes . **motorised boats,** few in Shimoni area, larger number in Kiwegu/Vanga..	Inshore , lagoons, creeks, shallow waters, sea grass beds Offshore-deeper waters-reefs (in dry season mainly)	**Low to high** Fishing is the most important activity in most of the sub locations. However tourism and other activities are also present.	Women involved in fishing prawns/fish, and/or in octopus fishing except in Milalani. Women are involved in fish trading all the area and food selling to fishers.

Although the ecosystems vary, the artisanal fishing use patterns are relatively homogeneous in terms of gear used, location of fishing etc. Higher percentages of the male population are found to be involved in fishing in the Vanga-Gazi stretch (13%) and the Ungwana Bay area (8%). Seasonality did not appear clearly in the interviews whether for gear use or species exploited. This was also found in the South coast by McClanahan and Mangi (2001). However nets, particularly driftnets are used more during the dry season and this confirms other findings (Obura *et al*. 1998; Obura, 2001; Malleret-King, 2000).

The ranking of dependence on fisheries resources is only tentative as information was collected at sub-location levels. Information at a much smaller level would be necessary as sub-locations may have large inland parts (see section 3).

2.4. Catch, trends and reliability of statistics

2.4.1. Catch and reliability of fisheries statistics

Catch data vary according to sources of information. Marine catch rates have been estimated between 3 and 10 tonnes/kmsq/year (CORDIO, 1999). In the Diani area, one of the least healthy reef associated areas in Kenya, the catch rate has been estimated to be between 105 and 130 (depending on the area) kg/ha/year (Rubens, 1996).

The marine fish catch is estimated by Sanders et al. (1990) to be 8.3% of the total Kenyan fish catch and reach 12000 tonnes per year. Average marine fish and other marine products catch (1991 to 2000) was estimated to reach 5847 tonnes yearly on the basis of Fisheries Statistics (see Appendix 4) with nearly 50% of the total catch coming from Mombasa (see Table 5). Mombasa landings contribute for most of the catch of crustaceans, sharks and rays and other (including beche de mer, octopus and squids). Lamu landings contribute for a large percentage of the demersal catch (40%).

Table 5: Percentage of catch (average 1991-2000)* per District (compiled from Fisheries Department statistics, see Appendix 5)

	Lamu	Tana	Malindi	Kilifi	Mombasa	Kwale
Demersal	40.23	2.83	3.19	4.52	23.81	25.44
Pelagic	16.05	0.52	10.79	12.58	18.66	41.39
Sharks and rays	2.63	0.77	1.43	4.46	78.04	12.67
Crustaceans	9.32	0.70	2.37	0.57	81.06	5.99
Other	0.82	0.00	0.90	6.06	66.59	25.63
Total	**20.07**	**1.46**	**3.48**	**5.03**	**48.55**	**21.40**

** data for all Districts was provided for 1991 to 2000 except for Kilifi which was only provided for 3 years (1997-2000).*

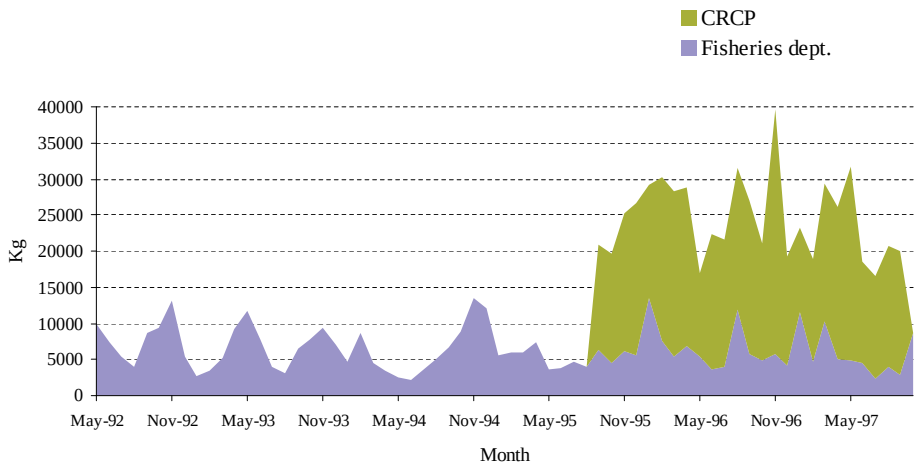
However, national catch statistics have to be taken with caution. Catch statistics are produced by the Fisheries Department. Yearly reports are produced at the District level based on data gathered by Fisheries Scouts. The statistical requirements from Fisheries Scouts are the monthly weight of the catch at each landing site in their jurisdiction (many sites), the monetary value of the catch, the total amount consumed locally and the amount transported to other areas. The catch composition should also be detailed. This however is an impossible task in view of the number and location of landing sites, the number of Fisheries Scouts and their limited resources.

Effort data, as in number of gears, number of boats, number of fishermen is recorded as extra information but the recording is not consistent in all the districts. The FAO frame survey approach has not been adopted although the Fisheries Department recognises that it would be more effective since the field staff are few (Fisheries Department personnel Mueni and Muturi *pers comm*).

Thus it is widely recognised now that the yearly quantitative data produced by the Fisheries Department is not reliable (King, 2000). According to Glaesel (1997), Fisheries Scouts would often not turn up for work and if they did they would sometimes not record the catch. Similar observations were made by King (2000) and Malleret-King (1996, 2000). Night catch was not recorded and the catches taken home by fishers or fish traders were not recorded either as it would not be weighed. Glaesel (1997) estimated that the catch taken home represented 30% of the total catch. It is thus believed that catch statistics and quantitative information based on the analysis of these catch statistics are not reliable.

Figure 2 illustrates the difference between data collected by the Fisheries department and that collected by the Coral Reef Conservation Project in the Diani area south of Mombasa. CRCP is an independent organisation supported by the New York based Wildlife Conservation Society that undertakes coral reef related research in Kenya.

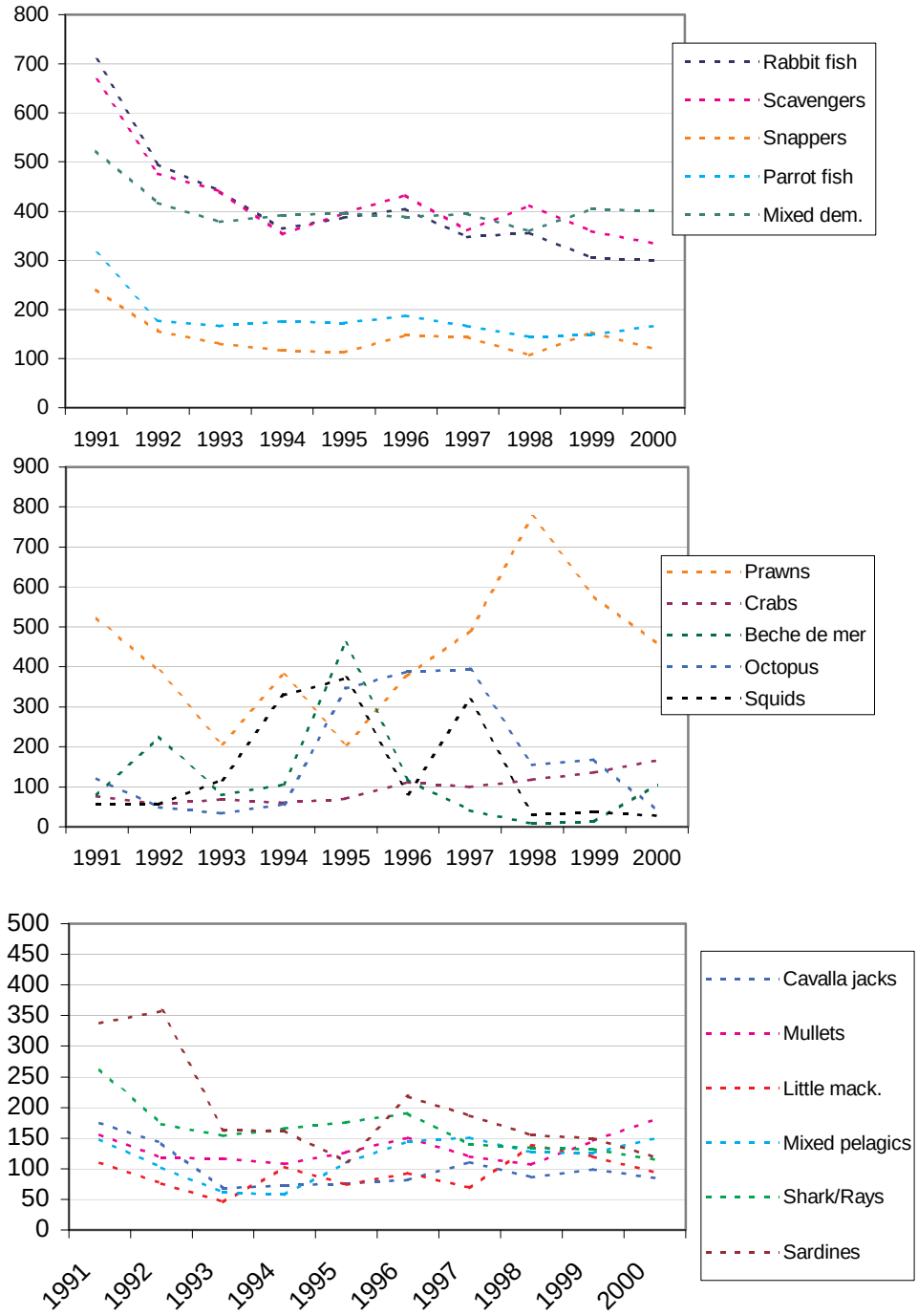
Figure 2: The difference between catch statistics for the Diani/Galu Kinondo area collected by the Fisheries Department (May 1992 – Sept. 1997) and CRCP (Sept. 1995 – Sept. 1997)
(Source: Fisheries Department - Diani substation; CRCP)



2.4.2. Trends

The following figure shows the evolution of the catch per species from 1991 to 2000 (Fisheries Statistics). Again, it must be stressed that even trend data is likely to be highly inaccurate based on Fisheries Department data, for the same reasons as discussed above. The Fisheries Department readily admits to these shortcomings.

Figure 3: Evolution of catch in MT between 1991 and 2000 (source: Fisheries Department statistics, see Appendix 4).



As illustrated by Figure 3, most of the demersal species catch is declining except for parrot fish catch which seems relatively stable. Sardine catch is declining. Although there is no indication of effort variations, it is unlikely that the effort has dropped as most information available suggests a stable or an increasing number of fishers (McClanahan and Mangi, 2001; Rubens, 1996), which suggests a decline in the resource. The only clear positive trend is in prawn catches. However, as suggested in above, catch trends based on Fisheries Department's catch statistics are unlikely to be reliable.

Trends in marine fisheries resources can be derived from, for example, catch per unit effort information. Thus information on fisheries resource health can also be gathered by looking at the abundance of sea urchins (McClanahan, 1995b). Size and composition of catch can give indications of the health of fisheries resources. A catch dominated by herbivorous species can indicate a situation of species overfishing (Watson, 1996) because slower growing and commercially highly desirable top predators are more prone to depletion (McManus, 1997). Keystone species such as sea urchin can also give indication of the health of the ecosystem (McClanahan, 1996). Finally trends can also be identified through the collection of qualitative information, using perceptions of resource users for example.

Although it is felt that the quantitative data produced by the Fisheries Department cannot be used to identify trends, a number site-specific studies have been carried out looking at the status and trends of the fisheries resources.

Within the context of these studies, catch monitoring was done for a few years independently (McClanahan and Mangi, 2001), biophysical surveys have been carried out (McClanahan, 1995a), fishermen perceptions of catch trends have been investigated (Rubens, 1996; Malleret-King, 1996; Glaesel, 1997; King 2000; Malleret-King 2000). Most of these studies have concentrated on the south coast, and on Marine Protected Areas.

Research has shown that fisheries resources in the south coast are overexploited and that the catch/fisheries resource health is declining.

The Diani area is one of the most overfished and degraded reef areas in Kenya (McClanahan *et al*., 1996). Very high levels of the sea urchin *Echinometra mathaei* were observed in the Diani lagoon area which indicates a depletion of urchin predators, particularly species such as the orange striped triggerfish (*Balistapus undulates*) and the tripletail wrasse (*Cheilinus trilobatus*) (McClanahan, 1995a). In Diani lagoon abundances of around 5,000 kg/ha (wet weights) were found compared to marine protected areas in Kenya where sea urchin abundance were between 20 to 375 kg/ha (wet weight) (McClanahan *et al.*, 1996). The indications are that the ecosystem is changing to algal turf, seagrass and sand. This is a change to less complex topographic habitats and consequently fewer fish species.

Catch data collection carried out for five years (1995 to 1999) at 8 landing sites (areas of Kenyatta Beach in Mombasa, Diani, Galu and Kinondo - see map 7) showed a decline in the catch despite a constant effort at all sites. The average daily catch per landing site showed an annual decline during the study period of an average of 6 kg which amounted to 320g per fisher, bearing in mind that average catch per fisher per day was between 3.2 kg and 3.7 kg depending on the landing site (McClanahan and Mangi, 2001).

The decline in catches is supported by the fishermen's points of views investigated by King (2000) and Rubens (1996). According to local fishers, the suggestion is that catch per unit effort has dropped significantly in the last thirty years. Catch per day per fishermen is very low in the Diani area and varies between 4 to 6 kg at the most productive site and season and less that 1 kg during the least productive season (Obura, 2001; King, 2000; Rubens, 1996).

In the Shimoni area according to the research carried out by Watson (1996), the catch landed was still diverse and top predators were still present which could suggest that at the time of the research the Shimoni fishery was still healthy. However, Interviews carried out with fishers in 1997/1998 in the same area showed that the general impression of fishers was that the resources had declined. Stakeholders pointed out that it was not so much the amount of fish caught that had changed but time necessary to catch the same amount of fish had increased significantly (Malleret-King, 2000).

2.5. Threats to fisheries resources

Increased exploitation, destructive gear, pollution, erosion and coastal development are considered to be the main threats to marine resources in the region (WWF, 2002).

2.5.1. Decline in fisheries due to increased effort and destructive gear

The decline in catch is attributed to the introduction of destructive gear, particularly small meshed beach seines, and the increase in number of fishers.

Tanzanian fishers (specifically from Pemba Island) introduced Beach seines to Kenya approximately 30 years ago when people fled Tanzania for political reasons (King, 2000). Beach seines are considered destructive because of the small mesh sizes (< 3cm) and the nature of dragging the nets over seagrass beds and coral areas and consequently catch a wide array of juvenile fish (King, 2000). Local fishers estimated a 90% drop in trap catch since the arrival of beach seines (McClanahan *et al*., 1996). McClanahan and Mangi (2001) showed that in some areas where beach seines were excluded, higher fish catches were observed which suggested that they out-compete other gears. Effects of beach seines also include habitat destruction and consequently the alteration of reef habitats. Beach seine fisheries are also associated with low reef fish diversity and population size and (Mwaura *et al*., 2001). Beach seines are widely used by migrant Tanzanian (Pemba Island) fishers along the coast of Kenya and in some places have been adopted by local crews. The real and perceived damage they create to the fishery has led many Kenyan fishers to take action and beach seines have been banned by local fishers from several areas along the coast, supported by the Fisheries Department (King, 2000).

The inshore prawn trawling carried out in the Ungwana bay (Tana District, see Map 3) is also associated to local fisheries depletion (Mueni, pers. comm.). A high rate of by-catch and habitat destruction are the main issues associated with Ungwana Bay inshore trawling. Damage to local indigenous fisher's gear caused by the inshore trawling further increases the conflict between the artisanal fishery and the prawn trawling fishery. Preliminary research shows that fish landings have declined (Fulanda and Motong'wa, 2001), further research is being conducted on the impact of the prawn trawling in the Bay.

The high number of fishers is also a cause for the decline in the fishery. Fisher density can give indications on the likelihood of overexploitation; McClanahan (1995a) estimates from his ecological model that at fisher densities of 8 to 9 fishers/sqkm in Kenyan lagoons, the ecosystems goes through a significant ecological phase shift from fish-grazer dominated communities to sea urchin dominated communities. Above the critical point of 9 fishers/sqkm, catch and catch per unit effort drops dramatically. The critical density of fishers has been reached in the Diani area, one of the most overexploited areas in Kenya (King, 2000).

Increased pressure on the resources is also attributed to an increase in demand for fish due to a growing coastal population and new markets such as the tourism industry in certain areas (Obura, 2000).

Poverty might have also contributed to the increased pressure on resources. Food poverty and overall poverty in the Coastal Province have increased steadily from 1992 to 1997 (see section 3, GK 2000). Fishing is often an activity of last resort and would therefore be a growing activity in an environment of increasing poverty. Although younger generations, who may be more educated, might not wish to enter the fishery, the lack of jobs pushes them to fish (Malleret-King, 2000). Furthermore, catch decline leads fishers to increase their time at sea to get enough fish for sufficient income (McClanahan and Mangi, 2001), and this results

in less time to carry out other livelihood activities and thus contributes to further pressure on resources.

It is believed that most of the fisheries along the Kenyan coast show signs of overexploitation. In Lamu however, according to Dr. D. Obura (*pers. comm*.) the fisheries resource is generally healthier due to lower levels of exploitation and a more productive resource base (see section 2.1 above).

2.5.2. Habitat destruction

Coral reef, mangroves and sea grass beds are key habitats (shelter, nursery grounds or feeding grounds). However, these habitats are threatened in a number of areas, potentially contributing to the decline of fisheries resources. The main threats to these habitats come from the use of destructive methods, population growth, pollution, erosion, coastal development and natural phenomena (WWF, 2002). Impacts of natural phenomena are exacerbated by habitat degradation due to anthropogenic causes (WWF, 2002).

Mangroves play a variety of ecological roles including trapping sediments and nutrients from land-sources, binding soft sediments and preventing shoreline erosion, providing habitat for birds and invertebrates and breeding areas and nurseries for juvenile fish and invertebrates. On the human-side, mangrove forests are an important source of food (e.g. fish, molluscs, crustaceans), building materials (e.g. houses, furniture, boat masts, fish traps) and fuel wood (UNEP 1985). Main threats to mangroves in Kenya are the extensive clearing and pollution from urban centres, this has happened around Mombasa (Semesi, 1998). In other areas, extensive clearings have been carried out for agriculture and to establish salt pans, particularly on the North coast (Semesi, 1998). Unsustainable harvesting of poles for construction, fuel wood etc is an important threat. Storms and other natural causes also contribute to mangrove loss but their extent is not quantified (Semesi, 1998).

Agricultural runoff and the release of untreated domestic sewage both affect water quality. Research around Mombasa has shown that the high bacteria level affected the fisheries resources and could put human health at risk (Mvoyi et al., 2001). Poor water quality, eutrophication and high sediment loads contribute to the degradation of coral reefs and consequently impact on fisheries.

Furthermore, Kenya's coral reefs were severely impacted by the 1998 El Nino bleaching event, which resulted in the widespread bleaching and mortality of 50-90% of its reefs (Wilkinson, 1998; Obura, 1999). Mortality was particularly high along Kenya's southern reef with losses of live coral in the order of 66-80% (Obura et al., 2000b). Corals on the northern reef complex were less impacted due to the influence of the cold-water Somali upwelling system further north. Loss of these key habitats are a threat to fisheries resources and also contribute to coastal erosion which is a problem in some areas (IOC, 2000).

2.6. Tentative valuation of the artisanal reef fishery

Due to the lack of reliable catch statistics, the impossibility to get export statistics of marine products from the Fisheries Department and the very sketchy information on the potential of the fishery (see sections 2.4, 2.2.1) it is difficult to estimate the value of the fishery.

Rubens valued the Diani reef fishery in 1996 at 23.8 millions Ksh (based on mean catch per year). The fishing grounds were estimated to be 23 sqKm, thus the value of the artisanal fishery was just above 1.03 Million Ksh (8,583 GBP at 1 GBP=120 Ksh) per square km.

On the basis of Rubens's valuation, a rough extrapolation can be made. The reef fishery area in Kenya is:

- 200-210 km of fringing reef (Shimoni to Malindi) located 500 to 800 m offshore (average 650 m) thus an area between 130-136.5 sqkm
- 40-70 Km of reef in the Lamu area located 1 to 2 Km offshore (average 1.5 Km) thus an area of about 60-105 sqkm.

The total reef fishery area would be between 190 and 241 sqkm.

Based on Rubens' results the value of the reef fishery would be 248.23 Million Ksh (2.07 Million GBP). This figure only takes account of the artisanal reef fishery and it is believed to be a very conservative estimation because it is based on the value of the catch of one of the most overexploited areas in Kenya. In addition the calculation of reef areas is extremely rough and must be taken with caution.

The lack of information on the value of the fishery contributes to the underestimation of its importance. The conservative value of the reef fishery at 2.07 million GBP per year does not include the commercial and non-reef artisanal fisheries. However, export data could not be obtained from the Fisheries Department, and because national catch statistics are so unreliable, we feel we have chosen not to estimate these additional values because it would be misleading. The valuation presented about must be considered extremely tentative.

2.7. Summary on fisheries characteristics and context

The Kenyan coastline is characterized by a variety of ecosystems, ecological characteristics (two main biophysical regions were identified) and a dual climatic pattern, which affect fisheries resources diversity, productivity and uses.

The narrow continental shelf is believed to limit productivity for the development of large-scale fisheries (Bakun *et al.*, 1998) except for the possibility of highly migratory species. The richest waters are found in the northern coast of Kenya, in estuaries and associated bays where commercial fisheries are supported. Oceanographic parameters such as current flows accentuate the difference in richness of the waters, decreasing richness during the SE monsoon due to increased downwelling conditions, and increasing richness in some parts of the coast during the NE monsoon through the southerly flow of upwelled waters. Access to the resources is also limited during the SE monsoon when conditions are rough.

The main species exploited by the artisanal fishery are reef and sea grass associated fish species. The demersal species are estimated to make up 39% of the marine catch. The total marine catch 1991 to 2000 averaged 5,800 MT. The larger percentage of demersal fish is landed in the Lamu area and the largest part of the overall catch is landed in Mombasa (although not necessarily caught in the Mombasa area). However data produced by the Fisheries Department of is of doubtful reliability, these figures are thus questionable. The catch is probably underestimated as it is often not recorded (see Figure 2). Similarly, the potential for the marine fisheries in Kenya varies highly according to the source of information (see section 2.2.1) from 20,000 MT to 300,000 Mt yearly.

The number of people involved in the fishery varies between 5,000 (UNEP, 1998) and 12,000 (Ministry of Tourism and Wildlife, 1989) and the total number of people depending on the fishery is estimated to be between 30,000 and 63,000. Using estimations of the number of fishers in different sub-locations, and the 1999 census data, an investigation of the proportion of men involved in fishing activities per sub-location was carried out. The highest proportions were found in the Tana and Kilifi Districts. However as for the catch, numbers of

fishers are difficult to obtain. Although fishers have to register with the Fisheries Department by law, many do not. Thus numbers of fishers are probably underestimated.

The lack of reliable information on catch and numbers of fishers contributes to underestimating the importance of the marine fishery in Kenya and probably perpetuates a lack of management effort.

The fishery is mostly artisanal (UNEP, 1998) with non powered boats (mainly dug out canoes and out rigger canoes). Although biophysical characteristics vary along the coast, fishing patterns are relatively similar in terms of gear used and fishing location. Fishing is a nearshore activity. This is partly due to the fact that boats used are small and not very seaworthy.

There is no information available at the national level on the catch per gear or the proportion of each gear used along the coast. But studies in the south coast suggest that spear guns and beach seines are the most used gears. Beach seines were used by more than 20% of fishers in the Diani area and spear guns by up to 46% of the fishers (Wanyonyi et al., 2003). These are however prohibited in Kenya. Beach seines have been prohibited for a few years and spear guns are now banned but the law is not effectively enforced yet. The ban on these two gears will affect the livelihood of numerous fishers, particularly younger fishers which are the main participants in these fisheries. The benefits of banning spear guns do not appear clear, however. These studies and the review interviews show that traps, handlines, gillnets, traditional spears are also widely used.

The wide use of beach seines are suggested to be one of the reasons for the decline in fisheries resources. Fisheries statistics suggest a decline or stagnation of catch landed of the main targeted fish species (Figure 3) between 1991and 2000. However as mentioned before, these statistics are likely to be unreliable. Furthermore, there is no national information on effort within the same period of time. However other studies suggest that effort is likely to have increased. More reliable research carried out on the south coast of Kenya found that resources are overexploited, and it is suggested that this is the case on the whole of the Kenyan nearshore fishery except for possibly Lamu.

Fisheries resources are threatened by a combination of factors, the high number of fishers, the increase in demand for fisheries products (tourism and population growth), the use of destructive gear such as beach seines and trawling and also by the degradation of key habitats. Pollution has contributed to the degradation of mangroves and coral reefs, mangroves are also used unsustainably due to population growth and urbanization along the coast. The impacts of natural phenomena such as storms or El Nino on these habitats are exacerbated by the man-made degradation.

The lack of quantitative information on the fishery contributes to the underestimation of its importance and the implications threats to the fishery to the coastal economy. Little data is available on the value of the fishery as a whole. However the valuation made by Rubens (1996) suggests that the value of the fishery could be above 1 Million Ksh per sqKm fished. This would bring the value of the reef fishery at least as high as 2.07 Million GBP per year. This figure was extrapolated from Rubens' figure which was based on a degraded fishery. This figure only takes account of the reef fishery, the commercial, and non-reef associated fisheries are not taken into consideration.

The continuing decline in the fishery will therefore have an important impact on the coastal economy as well as on the livelihood of numerous fishers, fish traders and their dependents.

3. Kenyan fisheries: socio-economic characteristics

Information in the following section comes partly from existing literature but predominantly from interviews carried out for this review.

3.1. Fisheries stakeholders

3.1.1. Origin of the stakeholders

Most fishermen and fish traders, the main marine fisheries stakeholders, are part of the Mijikenda or nine tribes who populate the coast. The Mijikenda are composed of the Kauma, Giriama, Chonyi, Jibana, Kambe, Ribe, Rabai, Duruma and Digo. They are spread from the Tanzanian border in the south to the Northern part of Kenya and make up most of the fishing people. However, north of Malindi and particularly in Lamu, fishing people are also of Bajuni origin. Finally, migrant fishers from Pemba Island (Tanzania) are also commonly found along the coast (Glaesel, 1997; King, 2000).

3.1.2. Gender division of fisheries dependent livelihoods

Fishing is predominantly a male activity. However women also participate in fishing activities in specific areas. This is the case in the Shimoni area where women are involved in fishing octopus (Malleret-King, 2000). In Uyombo in Kilifi District, women have recently started to fish using nets (Tunje, pers. comm.). In some other areas a small number of women are involved in prawn fishing or in collecting shells (*source*: interviews)

Fresh fish trading is often left to men who carry the fish in baskets and sell it to residential areas outside the villages (non-local residents including expatriates and people from inland Kenya), hotels, or go to larger traders who own freezers. Any surplus is sold in the villages. Women fish traders specialise in buying fish to fry and selling in the villages (Malleret-King, 1996). Women fish traders are much more numerous than the men fresh fish traders (pers. obs.).

3.1.3. Dependence on fisheries resources

Activities are carried out on the coast include fishing, fish trading, farming, tourism employment, quarrying (extraction of fossil coral blocks), small businesses (farm product trading, cooked food selling, charcoal and wood trading etc.). These are often carried out simultaneously in one household. This enables the household to spread risks. Furthermore, some activities are seasonal.

A study in southern coastal Kenya showed however that the percentage of households in coastal communities depending at least partly on fishing for their livelihood can be as high as 80% (Malleret-King, 1996; Malleret-King 2000). However there is no wide spread information available on dependence on fisheries resources at the national, district or local levels.

It was attempted in this review to gather information on dependence on fisheries resources at the sub-location level through the interview carried out during the review period. The following assumption was made: areas where there were a variety of activities available would be less dependent on fisheries than areas where fishing related activities appeared to be the only activity. The informant had to rank the activities according to importance.

To analyse the dependence information gathered through the interviews, it was attempted to rank the dependence on fishing from low to high in comparison to other livelihood activities (see appendix 2). The dependence was considered:

- **High**: if fishing ranked 1 or 2 and fish trading/farming/business are the only other activities mentioned by the informant. Fisher households usually depend on more than one livelihood activity. For example, subsistence farming is often carried out and the women are often involved in small businesses such as selling foods, snuff, weaving etc. (Malleret-King, 2000; Malleret-King, 1996) (See Appendix 2).
- **Medium**: if fishing was ranked 1, 2 and one income generating activity other than fish trading/farming/business (such as tourism, quarrying, transport) is mentioned by the informants
- **Low**: if fishing is ranked less than 1 and several other income generating activities. Or if fishing is ranked 4 or 5 even if no other income generating activities mentioned.

Table 6: Level of dependence on fisheries resources along the coast

Dependence of sub-locations*	Percentage	N
High	24	9
Medium	62	23
Low	14	5
TOTAL	100	37

* No sub-locations are represented from the Lamu District

A quarter of the sea bordering sub-locations would be considered as having a high dependence on fisheries resources and two thirds as medium. This means that for 80% of the coastal sub-locations investigated, fishing of fish trading were ranked as the main activity by the informants (see Table 6).

Table 7: Level of dependence at the District level

Districts	Percentage level dependence				Number sub-locations	Percentage of male population involved in fishing*
	High	Medium	Low	Total		
Tana	0	100	0	100	1	21.4
Malindi	20	80	0	100	10	3.3
Kilifi	0	78	22	100	9	4.1
Mombasa	50	50	0	100	6	0.5
Kwale	36.4	27.2	36.4	100	11	3.5

* Results extracted from Table 4.

The level of dependence at the District level was investigated. Only sea bordering sub locations were taken into consideration (see Map 1). From the review investigations, it would appear that Mombasa and Kwale would be the most dependent Districts on fisheries resources. The majority of the sub locations in the other Districts are medium dependent on these resources (see Table 7).

These results do not compare with results obtained in Table 4. Table 4 would suggest, if looking at the percentage of male population involved in fishing, that the Tana and Kilifi Districts would be the most dependent on fisheries resources. Mombasa would be the least dependent. The number of fishers mentioned might not be reliable in table 4 as there are no published figures but is most likely to be underestimated (see section 2.2). However, results

obtained in Table 7 at least for Mombasa are unlikely. It was noticed that, for Mombasa, informants ranked activities at the landing sites rather than at the community level. This has biased the ranking as it is obvious that at fish landing sites, the major activity is fishing. Furthermore, results are not consistent with Malleret-King's (2000) results in Shimoni where her research suggests that there is a high level of dependence on fisheries resources. Results from this review for Shimoni show a low level of dependence.

Problems identified for the interview results are: informants ranked economic activities at the landing site level rather than taking account of the whole sub-location, overestimating the dependence on fisheries resources (this was the case in Mombasa). It was also difficult to aggregate the information as informants gave information on specific areas rather than at the sub-location level.

No precise idea of the level of dependence on fisheries resources can be drawn from the review process. There is very little quantitative information on the dependence on fisheries resources at the local, regional or national level. Results from the review investigation are not sufficiently consistent to determine the level of dependence on fisheries resources even at the sub-location level. More research, at representative sites, needs to be carried out.

3.2. Socio-economic status of fisheries resources stakeholders

3.2.1. Poverty in the coastal province

According to the national survey of 1997 (GK, 2000) people living below the overall poverty line[1] in Kenya have increased from 40.1% in 1994 to 52.6 % in 1997. In rural areas the proportion is as high as 53.1%. Hard core poor[2] were 34.9% in rural areas and 7.7% in urban areas (GK, 2000).

The Coast Province is divided into 7 Districts (Lamu, Tana, Malindi, Kilifi, Mombasa, Taita-Taveta and Kwale, one of which does not border the sea (Taita-Taveta). The Coast Province (rural) was the province with the highest proportion of food poverty[3] (59.46%), above the national average of 50.65% and increasing since 1994. Similarly in terms of overall poverty the Coast ranks as the second highest proportion with 62.1 % poor (adult equivalent) (national average for rural overall poverty 53.2%) increasing steadily since 1992.

Kilifi is one of the poorer sea bordering Coastal Districts closely followed by the Kwale District. 63.7% (Kilifi) and 58.9% (Kwale) (adult equivalent) live under the food poverty line, a higher % than the national average of 50.6% for both Districts and a higher % than the Coast Province average of 59.5% for the Kilifi District. In terms of overall rural poverty, Kilifi scores first of the sea bordering Districts with 66.3% of adult equivalent rural poor (average Province: 62.1%) again followed by the Kwale District (60.5%) (see Table 8).

[1] Absolute poor: household living under the rural absolute poverty line which takes into consideration the food and non-food basic requirements (i.e. health, education) in monetary terms (GK, 1997: 35).
[2] Hard core poor: even if the household allocated all its resources to food, the minimum basic food need would not be met (GK, 2000: 192).
[3] Food poverty line: is calculated on the minimum calorie intake per day per adult.

Table 8: Rural poverty (Adult equivalent) in the Districts of the Coast Province

District	Food Poverty	Overall poverty	Absolute poverty	Hard Core poverty
Kilifi	**63.68**	**66.3**	**66**	**48.98**
Kwale	58.94	60.5	61	44.8
Lamu	31.86	39.35	39	18.44
Taita/Taveta*	62.44	65.82	66	47.25
Tana River	31.23	34.22	34	12.77
Coast	*59.46*	*62.1*	.	*44.78*
Kenya	*50.65*	*52.93*	.	*34.82*

* Taita/Taveta does not border the sea although part of the coast Province. Adapted from GK, 2000

3.2.2. Socio-economic status of fisheries dependent households

Although there is very little information at smaller scale and no governmental information published on the socio-economic status of fishers and other fisheries stakeholders, research carried out on the South Coast suggests that fishers are one of the poorer groups on the coast.

The very low catch from Mombasa to Kinondo (South Coast) has lead researchers to believe that fishers, if depending mainly on fishing for income, may earn less than the minimum wage (corresponding to 3 kg of fish per day or 0.6 GBP - McClanahan and Mangi, 2001).

Using income as an indicator, a study carried out in Diani showed that no fishing dependent stakeholders were in a secure socio-economic position (Malleret-King, 1996; King, 2000). Another study, using food security indicators (food coping strategies) showed that in Shimoni fishing dependent households were the least food secure households in comparison to households depending on tourism, non tourism employment, casual labour and other livelihood activities (Malleret-King, 2000).

Finally a study carried out in Uyombo (North Coast) showed that fishing groups were very poor particularly around MPAs (Tunje *pers. comm.*).

Information on the socio-economic status of fishing dependence is very scarce and relies on site specific studies. The results of these studies suggest that fisheries dependent groups are relatively poor, and in some areas, the poorest groups.

3.2.3. Gear choice and economic constraints

Although skill, time and energy factors come into consideration, the most constraining factor in the choice of a gear is the cost involved in its use. In calculating the cost of a particular gear a fisher has to take account of its durability (regularity of replacements) and of the need to use other capital items more or less costly, such as a boat (Table 9).

Table 9: Gear costs*

Gear	Price	Duration**	Boat requirement
Handline	500 - 1000 Ksh	6 months to 2 years	No (inshore) Yes (offshore)
Traps	Home made to 300-600 Ksh	1 - 3 months	Yes

Tidal weirs	Small: 2000 - 5000 Ksh Large: 5000 - 10000 Ksh	1 year 5 years	No
Spear	Home made	2 years	No
Spear guns	200 Ksh/home made	1-2 years (except the rod)	No
Nets	5000-10 000 Ksh	5-7 Years	Yes- Large and/or powered (except for cast nets and some small gill nets used from the shore)

* Adapted from fishers (pers. comm.), Malleret-King (1996), Rubens (1996) and Glaesel (1997).
** The duration of gear varies greatly. Hooks are regularly lost and lines can be broken easily. Nets can be lost but can last several years. The spear of a spear gun is lost easily but the rest can be kept for a year or two. The large structure of the tidal weir can last two or three years. These are just order of magnitudes of the duration of the most costly part of the gear

The need for a boat is one of the largest constraints for a fisher (Rubens, 1996). A standard canoe needed for handlining or trap fishing costs on average 12,000 Ksh if bought, and between 3000 and 5000 Ksh if it is made by the fisher from a purchased log. This represents a very large investment for households whose available income is very low (e.g. in Biga - South Coast, the fishers' available income was found to be about 22,000 Ksh per year and per active person, Malleret-King, 1996). Canoes last on average 7 to 10 years according to their quality. Larger non powered canoes necessary for net fishing offshore can cost up to 20,000 Ksh and a powered boat costs between 400,000 and 500,000 Ksh to which the running costs have to be added (Rubens, 1996).

Although the figures in Table 9 were collected in 1996/1998, discussions with fishers during this project (2002) showed that the prices of gear and boats are still relevant.

The Diani fishery is one of the most overexploited and degraded, the situation might not be as desperate in other parts of the coast. However, the little use of engines in the whole of Kenya suggests that fishers cannot afford them or that they are not cost effective.

It was found in these studies that spear guns were the most accessible gear for young people to enter the fishery as they have no capital to invest in boats. Spear guns require a lot of energy and fishing with them is strenuous, but the catch can be rewarding. Spears and stick obviously are the cheapest gear to use along with hand lining from the shore, however target species are more limited.

Most other gears in Kenya require the use of boats or expensive materials, the most expensive gears to use are nets although the catch can be rewarding. It was found in Shimoni that fishers using powered boats and nets were more food secure than others (Malleret-King, 2000). Nets are expensive and are also often rented rather than owned by the fisher using them.

Because of fishers' economic constraints, it is unlikely that banning spear guns suggested by the Fisheries Department along the Kenya coast will be realistically implemented. This would mean denying a large number of fishers their only source of livelihood. Alternatives have to be found first. It could also be argued that it is the most selective of all the gears, and with effective management could be one of the better gears to use, banning spear guns will also reduce the diversity of species targeted (see section 2.3.1b).

3.2.4. Fishing groups and access to capital

The main problems faced by fishers were investigated during interviews. Issues of gear use conflicts were mentioned during the interviews particularly between beach seines and other gears. However, the lack of access to more effective boats and gear and the lack of refrigerated facilities were the most common problems identified by the informants interviewed during the review process. These problems identified by informants were linked to the lack of access to credit.

Indeed, artisanal fishers have little access to credit. This forces fishers to use gears which are affordable, particularly gears which do not necessitate the use of boats. A number of fishers rent gear and boats from *Tajiri* (wealthier owners).

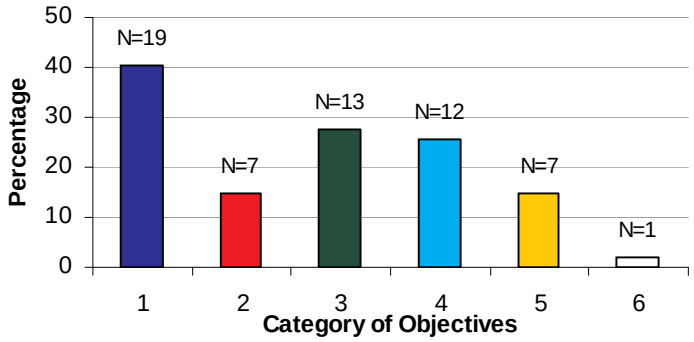
Fishers have no formal access to credit. Without regular income individuals have difficulties to getting formal loans (Malleret-King 1996). Further more credit is very expensive in Kenya with Bank interest rates of 20% – 30%. There are no development banks or microfinance schemes accessible to fishers on the coast of Kenya. People employed in a private context often get loans from their employers (pers. obs.). Self employed people such as fishers are forced to borrow money from local money lenders at high interest rates or borrow money from their family if available (Malleret-King 1996). Money lenders accept the repayment of interest in kind (trees for example) and tend to give very short term loans (Malleret-King, 1996).

Problems of access to finance faced by fishers and other fisheries stakeholders is not a recent one. It was thought that fisheries cooperatives, created in the 1970's, might contribute to alleviate this problem by providing loans based on savings made by member's contributions. However, most of the cooperatives collapsed soon after being set up due to mismanagement (King, 2000). During the interviews, only two functioning cooperatives were identified. These are the Mombasa Fishermen's Cooperative Society and the Magugu Fishermen's Cooperative Society (in Vanga). The former has no loan schemes for its members but aims at improving the efficiency of marketing. If profits are made, it is then distributed evenly among the members. The Magugu Cooperative has set up a revolving fund.

Increasingly fishers have set up groups, associations or committees since the collapse of most Fishermen's Cooperatives. The objectives and status of these groups vary but a large proportion of them are taking on the role of cooperatives and have, as an objective, to provide small credit schemes for members to facilitate access to gear.

During the interviews 47 fishermen groups were identified along the Coast (from Kipini to Vanga) (see appendix 3) with a range of different goals and objectives. It was found that 15 % of these groups had established loan schemes (see Figure 4). Note that some groups may fall into several categories this is why N>47.

Figure 4: Main objectives of Fishermen's groups



Legend/explanation:

- Category 1- **Conservation and management**: these groups are set up to improve the conservation of marine resources which can include marine mammal and/or turtles. Fishermen are not the only category of members but participate.
- Category 2- **Loans**: One of the main objectives of the groups is to provide access to loans to its members whether to buy gear or for personal purposes.
- Category 3- **Enforcement**: one of the main objectives of the group is to promote the enforcement of fisheries law, particularly reduce the use of illegal fishing gear. This category is composed mainly of Beach Management Committees (see more in section 4).
- Category 4- **Marketing**: one of the main objectives of the group is to facilitate and improve the marketing as well as bargaining power of the fishers.
- Category 5- **Development**: one of the objectives of the group is to promote "development". Mentioned were planning to develop fish farming or providing access to funds for the group through application for grants rather than setting up a scheme.
- Category 6- **Other**. This is one group which was set up to fight against the Fisheries Department banning their gear (spear gunners)

Table 10: Name, status and geographical location of Groups with the established aim of providing loans

(*source*: interviews)

Groups	Status	Location	Method
Soyosoyo fishing Club;	No loans or collection yet	North Coast	Fee of 5 Ksh per kg
Mkunazini Fishermen Group	No loans or collection yet	North Coast	10% of daily income
Takaungu Beach Committee	No loans or collection yet	North Coast	Not defined
Mtwapa Fishermen Union	No loans or collection yet	North Coast	
Mikindani Fishermen	Functioning?	Mombasa	Monthly fee
Msambweni Fishermen Youth Group	No loans yet but money collected	South Coast	
Magugu Fishermen Cooperative Society	No loans yet but some money collected	South Coast	

Although access to finances is one of the most common issues raised by fishers and the Fisheries Department, the majority of the groups have conservation and management objectives. Only 15% of the groups established have established a loan scheme, and, as shown in Table 10, for most of the groups mentioned this is not functioning yet. The loan

schemes are mainly based on small revolving funds. Fishers have to pay a certain amount per Kg of fish landed or a monthly fee. The money collected by the group is then given each month to a different individual. For these funds to work, however, individuals who have accessed money have to stay in the group and carry on paying their fee so that other individuals can get loans at a later stage. This often proves to be difficult. One of the main difficulties for the revolving funds is the collection of contributions.

Outside Fishermen groups, association or committees, fishers may access funds on an informal basis. It is common for fishers to obtain very small loans from fish dealers or traders to tie them over for a few days. This occurs particularly during the low fishing season when catches are poor or inconsistent (King and Malleret-King pers. obs.).

Access to funds and capital equipment is highly constrained in Kenya by the lack of organisation and trust among group members. Compared to other part of the world where the cooperative system is strongly developed, in Kenya there are very few avenues for fishers to alleviate these constraints.

Information is lacking in the literature on the avenues for fishers to get formal access to finances but discussions with fishers and studies carried out suggest that there is little hope for fishers to get formal loans from banks, the high interest rates would also be a deterrent.

3.3. Socio-economic aspects of the fishery and implications

The main stakeholders in the fishery are fishers and fish traders. Fishing in Kenya is a male dominated activity. Dependence on fisheries resources at the local level and at broader levels is not well documented. From various studies, it appears that fishing dependent people rarely depend solely on fisheries associated activities for their livelihood (see section 3.1). However a study in the south coast suggests that the dependence on fisheries resources can be very high at the local level (Malleret-King 2000). An attempt to determine the level of dependence of the different coastal District was made in this study but results do not seem to reflect what the authors believe to be the case. No conclusion could be drawn from this study about the level of dependence on fisheries.

Again the lack of information on the dependence on fisheries resources contributes to the general underestimation and lack of understanding of the importance of fisheries resources to the livelihood of coastal communities and how the loss or mismanagement of fisheries resources will affect the food security of fish dependent people. The lack knowledge may be related to a general lack of interest in coastal fisheries at a national level, but this lack of interest increases the vulnerability of fisheries dependent people who are already a vulnerable group.

The Coastal Province is one of the poorest provinces in Kenya. Although this information is not detailed enough to conclude on the socio-economic status of fishers it gives an idea of the economic context in which they operate. More detailed research suggest that fishers are one of the poorest groups in coastal communities, at least in the South coast of Kenya (Malleret-King, 2000) but there is little information on the wealth of fisheries dependent people along the coast.

Economic constraints contribute to increasing the pressure on the fishery. Economic constraints are one of the main factors affecting gear choice. Economic constraints also forces fishing to be mainly carried out in the lagoon or nearshore, where the resources are already overexploited, because fishers do not have the capacity to invest in more sea worthy boats, or engines to be able to access more distant fishing grounds. The inability to invest is

due to the lack of access to credit which perpetuates a situation where resources are used unsustainably. Fishers have little ways of accessing credit, on the one hand there are very limited opportunities to get access to formal bank loans, and on the other hand, informal access to credit is constrained by the lack of organisation and trust among community members and the small sums involved. Cooperatives and community groups, if established, are not functioning as sources of finance at present. If in need, fishers borrow from their family or from money lenders (Malleret King, 2000 and 1996). Often fishers resort to money lenders or their family only in case of crisis (Malleret-King, 2000) rather than for investing in fishing equipment. Unregulated money lending with high interest rates can trigger a situation where poverty is perpetuated due to long term indebtedness.

4. A review of key institutions relating to the governance of marine fisheries in Kenya.

The intention in this section of the review was to carry out an institutional analysis of the coastal fisheries in Kenya based on available literature. It became apparent that there is limited information on the institutional context coastal fisheries, particularly in relation to traditional and informal institutions, and due to limited time it was not possible to carry out primary research on traditional resource management systems. Consequently this section presents a review of both formal and informal institutions that influence the activities of resource users and the exploitation of fisheries resources in Kenya. These institutions are set out below, however, it should be recognised that there may be other institutions that have an indirect influence on the activities of people depending on fisheries resources which in some instances can have an impact on fisheries resources. For example land use planning and land adjudication and subsequent tourism development in the Diani area on the south coast has undermined traditional cultivation patterns leading to reduced food crop production and increased dependence on fishing (King, 2000).

4.1. Institutions and their roles

The **Fisheries Department** has the leading role in terms of management of Kenyan marine fisheries and is mandated under the Fisheries Act Cap 378 (Rev. 1991) with the development, management, exploitation, utilization and conservation of the Kenyan fishery resource. The main act covers a number of resource management aspects including registration of fishing vessels, licensing provisions, offences and enforcement. In addition to the Fisheries Act there is the Fish Protection Act which provides for control on the gathering of species such as pearls, pearl shells, oysters, cowries, crustaceans and corals. This Act is in line with the Convention on International Trade on Endangered Species of Wild Fauna and Flora (CITES), the Convention on Biological Diversity (1992), and the Nairobi Convention (1985). International agreements, to which Kenya is a signatory, also play a potential role in fisheries management. These include the FAO code of conduct for responsible fisheries which is ties in with the Convention on Biological Diversity (1992).

The Fisheries Department has recently focused on the inclusion of resource users in management through the creation of **Beach Management Committees** (BMC) as a means of improving fisheries management in coastal Kenya. The structures of these committees are closely tied to previous traditional institutions that had become largely defunct following the introduction of formal institutions governing fisheries in Kenya. This was highlighted by Glaesel (1997) who showed that most existing marine/fisheries related beliefs, taboos, superstitions or traditional practices that could have had *de facto* management effects on the fishery mainly relate to safety, social order, fishing skills, or religion. Although Glaesel's

research suggests that taboos and traditions regulating the relationship between fishers and the environment in Kenya were not sufficient to have an effect on the state of the marine resources, the Fisheries Department identified the traditional system of social organisation at beach landing sites as a means to increase the role of local level stakeholders in the management of the fisheries resources.

BMCs are thus based on previously existing management systems. Traditionally, fish landing sites were controlled by an elder of the landing site "*mzee wa bandari/liko*" whose roles were:

- Leading the local fishers within the landing beach
- Advising on the effects of seasonality; when and where to fish
- Advising on action to be taken in cases of accidents which were usually associated with evil spirits e.g. sighting a "*kitunusi*" (mythical being that brings bad luck)[4]
- Holder of authority in that landing area - his permission is sought by outsiders coming to fish there.
- Focal point in ensuring social cohesion within the local fishing community
- General management of gear use and the environment

The BMCs are replacing the *mzee wa liko/bandari* system in a context where traditional management systems have disappeared, particularly through the decreasing respect for elders' authority. BMCs are an effort by the Fisheries Department to devolve power to the fishers themselves to manage their resources at the local level through:

- Implementation of fisheries legislation; especially control of gear use through creating awareness of banned and destructive fishing gear
- Assisting in data collection where Fisheries staff numbers are inadequate
- Adopting modern environmental management practices in consultation with the Fisheries Department and other relevant organisations
- Marketing of fish
- Solving minor disputes on fishing grounds; referring any of these to the Department of Fisheries for resolution.

The role of the BMC's is therefore ultimately to serve as a link between the Fisheries Department and artisanal fishers, and to delegate a degree of management responsibility to fishers. The Fisheries Department has recommended that the BMCs be formalised and gazetted to give them a legal mandate to carry out their activities. However, most of them are still at their formative stages.

The Fisheries Department collaborates with other institutions (both governmental and non-governmental) in its effort to manage the artisanal fishery within the Kenyan coast. The key institutions and their linkages are set out below and Figure 5 illustrates these linkages.

Kenya Wildlife Service (KWS) assist greatly through their work in enforcement of conservation legislation especially within marine protected areas (MPAs) and adjacent areas. KWS also supports short surveys that assist in management of the marine resources. There is a draft memorandum of understanding (MoU) between KWS and the Fisheries Department, but it has not been ratified or made operational. Collaboration is dependent on individual project activities that focus on areas of common interest.

The Kenya Marine and Fisheries Research Institute (KMFRI) is the national marine research institution. The perception by the Fisheries Department is that KMFRI is primarily

[4] The evil spirits were appeased through sacrifices of food that was feasted on by the fishers and their families at sea. The left overs are thrown to sea for these spirits and the fishers believe that bad luck ceases forthwith. Mzee wa Bandari conducts such ceremonies. Old port fishers still give sacrifices once every year.

concerned with academic research and there is little of direct relevance to the Fisheries Department and management of small scale coastal fisheries (Fisheries Department co-authors in this study). The Fisheries Department has worked with KMFRI on a number of collaborative projects and is currently carrying out a survey to determine the effects of prawn trawling on the small scale fishery in the areas concerned. As with KWS, there is a draft MoU with the Fisheries Department which has not been ratified or made operational, and collaboration is dependent on projects of common interest.

The Coast Development Authority (CDA), though multi sectoral, consults the Fisheries Department on fisheries development matters. The main function of CDA is to coordinate development activities in the coast region that aim to improve the food security of coastal people, increase employment opportunities and diversify the rural economy. A major constraint to CDA's effectiveness to achieve cross sectoral coordination is the lack of supporting legislation to do so. CDA does not have any formal link with the Fisheries Department.

International governmental and non-governmental organisations such as World Wildlife Fund and The World Conservation Union (IUCN) support resource management activities at both the policy and site level, but tend to focus on marine protected areas. These institutions have no legal mandates with the Fisheries Department and all collaboration is also informal and intermittent.

Individual NGOs/local projects have also played an important role in carrying out site specific surveys that have yielded vital data on better gear use, coral reef conservation and management in regard to the artisanal fishery. In particular the Coral Reef Degradation in the Indian Ocean project (CORDIO) and the World Conservation Society funded Coral Reef Conservation Project (CRCP) have been active in this area. Here too, no legal or institutional mandates exist between these institutions and the Fisheries Department.

The same applies to the educational institutions (e.g Moi University, which is currently involved in the Sagana Fish Farm's fish propagation and pond dynamics project). Fisheries officers have been trained at these institutions to improve their technical knowledge but there are no formal links between the different institutions.

Indirect institutional influences include other environmental and land use policies. These include the Land Planning Act Cap. 303, Town Planning Act Cap. 134, Physical Planning Act No.6 of 1996, Agriculture Act Cap. 318, Environmental Management and Coordination Act (2000) and the Forest Act Cap. 385 of the Laws of Kenya. The Land Planning Act sets land planning regulations and gives local authorities the mandate to plan development within their areas, while the Town Planning Act governs all development in urban centres including coastal urban settlements.

The Physical Planning Act and the Environmental Management and Coordination Act are directly related to use of natural resources. The Physical Planning Act provides for declaration of certain areas as special planning areas and recognises ecologically sensitive areas and provides for their preservation. The Environmental Management and Coordination Act provides for an integrated approach towards environmental management. However, this Act has not yet been effectively enforced as the regulatory authority is in the formative stage.

4.1.1. Other sectors

Increasingly other sectors and industries are encouraged to get involved in fisheries management on an informal basis. For example, the hotel and tourism industry also seek

advice from the Fisheries Department in relation to sport fishing and the use of sport fishing boats where such sports affect the operations of the artisanal fishers.

Other industries collaborate with the Fisheries Department (e.g. Bamburi Cement factory) and participate in the coastal clean ups where awareness on environmental conservation is emphasised to the wider community.

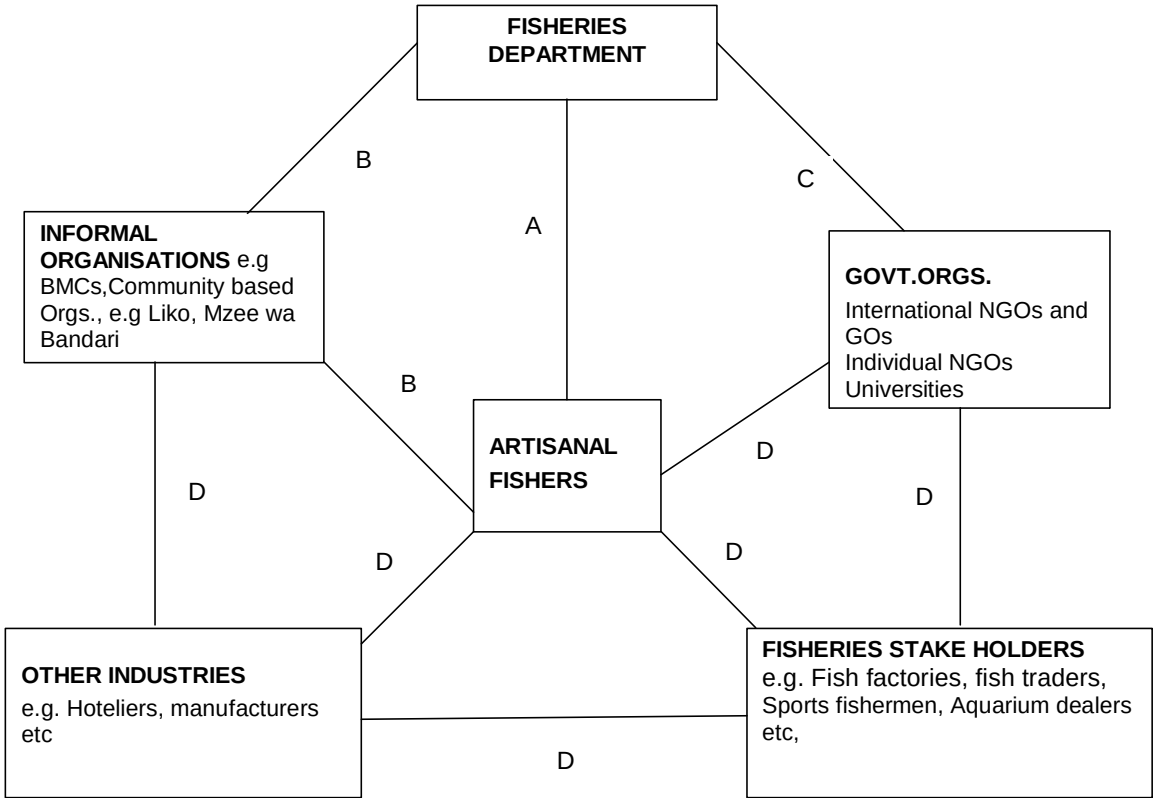
4.1.2. Summary

The linkages discussed above are summarised in figure 4.1 below. The Fisheries Department, as the organisation with the legal mandate to manage fisheries resources, has recognised that the existing financial and human resource constraints within the department have necessitated greater involvement of other stakeholders in management. This is also a reflection of contemporary approaches to fisheries management where the involvement in management of resource users is understood to be essential for successful management. The Fisheries Department has identified BMCs as an appropriate mechanism of involving local resources users in management, based on the prevailing traditional institutional environment, and is seeking to formalise these institutions through legal mechanisms. The Fisheries Department has also recognised the need for greater collaboration with a wider range of stakeholders in order to increase the effectiveness of their work. For example the department has held a number of industry focused forums on specific issues, particularly the prawn trawler/small scale fisheries issue in Ungwana Bay. The department is also a key participant in the Kenya Marine Forum, which is a multi-stakeholder forum that discusses a wide range of issues relating to Kenya's coastal environment.

The Fisheries Department has also recognised that the human resource and financial constraints within the department have made classical fisheries management, with its dependence vast amounts of data, an unworkable option. The department openly admits that the data provided in monthly reports, and summarised in national statistics, are highly inaccurate or false. The situation continues because of the bureaucratic nature of the Fisheries Department where, in such bureaucracies analysis has shown that individuals tend to adhere to rules and tasks in a ritualistic way and elevate these above the goals they were designed to realise (Merton, 1957). This becomes inefficient if changing circumstances, such as described above, have made the rules or tasks out of date or unworkable. The fact that the department is seeking the involvement of a wider range of actors is a clear sign that these shortcomings have been recognised and change is being implemented.

Figure 5: Linkages between different stakeholders in Kenya's coastal fishery

A = Legal mandate exists under Cap 378 (Fisheries Act)
B = Where legal mandate is being sought and is currently being discussed
C = Draft or proposed memoranda exists but not yet operationalised
D = " Loose" collaboration based only on issues arising from time to time



5. Site selection

A major objective of the review was to identify sites where detailed socio-economic research would be carried out to understand fisheries associated livelihoods and the constraints to their development. Due to the limited time available only a few sites could be selected so these had to be representative, as far as possible, of the Kenyan coast as a whole (and Tanzanian coast, see Annex 1.1).

5.1. Selection criteria

Six criteria were used to select sites:

1. Poverty: selected communities had to be poor as the project aims at targeting the poor
2. Biophysical environment (2a) and fishing use patterns (2b), including dependence on fisheries resources: these needed to be representative of the Kenyan coast and fishery.
3. Demography: communities had to be of manageable and representative size. Urban centres were eliminated as they are often too large and too complex for a short study.

Dependence on fishing in urban centres is also likely to be much lower than in rural coastal areas.

4. Accessibility: communities had to be relatively accessible. This relates to logistics of field research and of the census workshop (activity 4). Cost and availability of transport to the site, and from the villages to the workshop venue.
5. Information/on going and previous research projects: general information had to be available for the area but no previous extensive studies or on-going fisheries studies should have been undertaken or be underway in the selected communities. The main reason for this was to make sure that this project contributes to producing new knowledge. Furthermore, field research is often difficult if numerous studies have been carried as this often results in informant fatigue.
6. No Marine Protected Area: selected communities should not be adjacent to a Marine Protected Area. In Kenya the presence of MPAs can create community resentment towards any form of research or management authority. Fisheries around MPAs are also not representative of the majority of the coast as they are subject to different rules.

A first round of selection was carried out to identify least representative areas (the District, location and sub-location level when possible). For each criteria the most unsuitable areas were identified and given a score of 0, others were given a score of 1. Four criteria were considered eliminatory for an area:

- Inaccessibility
- The sites is an urban centre
- The presence of an MPA

Another factor which was eliminatory for an area was the presence of conflicts on resource use which would be an impediment for socio-economic work to be carried out (see Appendix 6).

For each area a total score was calculated. The higher the score, the more suitable the area for field research.

5.2. Selection of sub-locations

On the basis of the review (all previous sections) the following scoring could be made (see Table 11). Mtondia/Majaoni and Mdangarani both in the Kilifi District (see map 5) were the two sub-locations which scored highest (see appendix 6 for details on the selection process). Fishing communities where field work research was to be carried out were thus selected within these two sub-locations.

Table 11: Sub-location scoring on the basis of criteria 1 to 6 (see above) and other (eliminated areas are marked with a cross).

Districts	Sub-locations\Criteria	1	2a.	2b	3.	4.	5	6	Other	Score*
Lamu	Lamu town	3	1	0	X	X	1	X	1	X
	Mkononi/Kiunga	3	1	0	-	X	0	X	1	X
	Kwaiyu	3	1	0	-	X	1	X	1	X
	Rubu	3	1	0	-	X	1	X	1	X
Tana River	Kipini	2	1	0	1	X	0	1	1	X
Malindi	Fundisa	-	1	0	1	1	1	1	1	6
	Gongoni	-	1	0	0	1	1	1	1	5
	Ngomeni	-	1	0	1	1	1	1	1	6
	Mambrui	-	0	0	1	1	1	1	1	5
	Sabaki	-	0	0	0	1	1	1	1	4
	Shella	-	0	1	X	1	0	X	1	X

	Watamu	-	1	1	1	1	0	X	1	X
	Darkasi	-	1	1	-	1	-	X	1	X
	Jimba	-	1	1	-	1	-	X	1	X
	Dabaso	-	1	1	1	1	1	X	1	X
	Mida	-	1	1	1	1	1	X	1	X
Kilifi	Uyombo	5	1	1	1	1	0	X	1	X
	Mtondia/Majaoni	5	1	1	1	1	1	1	1	7
	Mdangarani	5	1	1	1	1	1	1	1	7
	Kilifi Township	5	1	1	X	1	1	1	1	X
	Takaungu	5	1	1	1	1	0	1	1	6
	Shimo la Tewa	5	1	1	X	1	1	1	1	X
Mombasa	Bamburi	-	1	1	X	1	0	X	1	X
	Likoni	-	1	1	X	1	1	1	1	X
	Mikindani	-	1	1	X	1	1	1	1	X
	Mishomoroni	-	1	1	X	1	1	1	1	X
	Port Reitz	-	1	1	X	1	-	1	1	X
	Island	-	1	1	X	1	1	1	1	X
Kwale	Tiwi	4	1	1	1	1	1	1	X	X
	Kitivo	4	1	1	1	1	0	1	X	X
	Ukunda	4	1	1	X	1	0	X	X	X
	Kinondo	4	1	1	0	1	0	X	X	X
	Gazi	4	0	1	1	1	0	X	1	X
	Vingunjini	4	0	1	0	1	1	1	1	5
	Milalani	4	0	1	1	1	1	1	1	6
	Shimoni	4	0	1	1	1	0	X	1	X
	Wasini-Mkwiro	4	0	1	1	1	0	X	1	X
	Vanga	4	0	1	1	0	1	1	1	5
	Kiwegu	4	0	1	1	0	1	1	1	5

* the total score of each location was calculated taking into consideration the poverty ranks.
**: When information was only available at the District or location level, all the sub-locations within the locations or District were given the same score.

5.3. Selection at the community level

After a reconnaissance trip and discussions with the Fisheries Department personnel three communities were selected for field research: Chumani, Mtondia and Kidundu, the characteristics of which are presented in Tables 12 and 13.

Table 12: General and socio-economic characteristics of selected villages

Village/area	**Size**	**Accessibility**	**Fisheries Information/projects**	**Activity ranking according to number of people involved.**	**Poverty** (level to be confirmed)
Mtondia	Medium	Very high	Little information	1. Fishing/Quarrying, 3. Small business (including fish traders)	Poorer: Fishers and quarry workers
Chumani	Small	High	None	1. Fishing/ Farming, 3. Quarrying/small business	Poorer: Fishers
Kidundu	Small	Medium	Biological research in the Creek	1. Fishing/Fish trading 2. Farming	Poorer: fishers

				3. Wood collecting	

Table 13: Fishing patterns of the selected communities

Village/area	Gear used	Vessel	Fishing location	Biophysical	Number of fishers
Mtondia	Seine nets, traps, hand lines, set nets, spear guns	A few dug out canoes	In and out of the lagoon depending on the season and gear	Fringing reef	100
Chumani	traps, hand lines, set nets, spear guns	Dug out canoes	In and out of the lagoon depending on the gear and the season	Fringing reef	100
Kidundu	Traps, hand lines, cast nets, tidal weirs	Dug out canoes	Kilifi Creek, in lagoon	Creek	80

The three communities are representative of the Kenyan coast small scale artisanal fishing, there is little information and no on-going fisheries/socio-economic projects in these communities, they are relatively accessible and represent a significant size population.

5.4. Constraints

Most information was available at District or Location levels. The lack of information, for example on the dependence on fisheries resources and on the socio-economic status of fishing communities along the coast made it difficult for some aspects to be taken into considerations at local levels. Further on-site research prior to site selection would have been necessary in order to have a clearer idea of dependence on fisheries and poverty of communities to be selected. Similarly there was no demographic information available at the community level.

However these constraints were partly overcome during the reconnaissance trip. By interviewing villagers and observing the villages, it was possible to get an idea of whether the communities were large or not and relatively wealthy or not (see Appendix 6).

Information was lacking for Lamu District. However this did not affect the selction process as Lamu was eliminated on the basis of its inaccessibility.

It is believed that the sites selected are representative of the coast as a whole and satisfy the selection criteria.

6. Conclusion

Marine capture fisheries in Kenya are predominantly small scale, artisanal and low capital intensive. The low productivity and narrow continental shelf along a large part of the Kenyan coast limit the potential to develop a larger scale fishery. The seemingly low catch of the marine fishery compared to inland fisheries, particularly Lake Victoria, has led a belief that the marine capture fishery is not important at the national level[5]. This perception was carried over from the British colonial era four decades ago and has meant that little effort has been put into the management of and research on inshore fisheries resources. One of the important consequences of this has been that national statistics providing basic information on the fishery has been shown to be highly inaccurate and should therefore used with caution when describing the status or trends of the fishery. The Fisheries Department faces significant financial and human resource constraints which makes their current approach to information collection unworkable. Misleading conclusions would be drawn from national fisheries statistics, a situation that is recognised by the Fisheries Department.

The suggestion in this review is that the artisanal fishery is undervalued, both in economic terms and from a food security perspective. Although the information necessary to value the artisanal fishery is lacking, indications are that it is worth well in excess of 2 million GBP a year, based on extrapolations from studies of the least productive area in the country. In addition the fishery supports up to 60,000 people based on the information available on the numbers of fishers, but again this is likely to be an underestimation because accurate information on the numbers of fishers (both full time and part time) is not available and the numbers of men and women fish traders are unknown. Furthermore this review suggests that fishers are often the poorest group in their communities, which places even greater importance to the fisheries resource base because, from a national perspective, the Coast Province is one of the poorest in the country and some of the seafront districts are the poorest in the province. The review also shows that in many instances the inshore fishery is likely to be fully or overexploited which has serious food security implications for a significant number of poor people in coastal Kenya. Thus the artisanal fishery in Kenya merits far greater investment in both management, research for management and development support than currently exists.

The principle reason behind the marine artisanal fishery being undervalued is the lack of understanding about the fishery. The lack of knowledge has led to the belief that the fishery relatively unimportant and consequently limited attention has been given to it, so perpetuating the cycle. Thus one of the key conclusions from this review is that there are significant knowledge gaps in relation to artisanal fisheries in coastal Kenya. The key gaps are summarised as:

- Poor quality quantitative information about the fishery due to unrealistic approaches to data collection in view of the financial and personnel constraints of the Fisheries Department;
- Very little and patchy information on the socio-economic status of fishing communities;
- Very little information on the dependence of coastal people on fishery resources;
- Very limited understanding of the potential offshore resources.

Another key finding is the lack of access to capital for fishers. Attempts to set up cooperatives in the 1970s and 1980s failed due to mismanagement and currently there are no facilities for poor people to access loans of sufficient size to bring about a change in

[5] Indications are that the Lake Victoria Nile Perch fishery is on the verge of collapse (IUCN Lake Victoria project, 2003 pers. comm.), this may draw greater national focus to marine fisheries.

resource exploitation patterns. Increasingly self-help groups are being established by fishers to try and solve this problem but they remain constrained by limited member contributions the lack of trust amongst members. The lack of access to capital is perceived to be a major constraint to the livelihood development of fishery dependent people. However, it is unclear in this review how successful greater capitalisation of the fishery would be because the implication is that it would be to exploit offshore resources for which there is little information about or exploit more effectively already declining inshore resources. Currently the fishery is very low capital intensive with very few motorised craft and a predominance of exploitation in shallow water lagoons using dugout canoes or no vessels. Greater capitalisation in the marketing and distribution chain may be a more viable option, but attempts in the past have failed (IFAD project 1980s) due to the inconsistency in the supply of fish and poor organisational skills in fisher groups. The need for greater support for fisher or fishery dependent groups is recognised in this review, this is highlighted below in relation to resource management, but would be equally relevant to aspects of the supply chain. One important issue to consider would be the importance of fish as a primary source of protein for poor people, and that interventions should not price fish out of the local market.

The review has highlighted the trend in management to shift away from a centralised top-down approach towards greater devolution of responsibility from the Fisheries Department to the fishers themselves. It was noted that traditional systems of management have become weakened in recent decades and that there is limited traditional management in place. However the information on traditional management institutions is limited to a few localised studies. Fishers have demonstrated an ability to make resource management decisions and enforce them as was the case in Galu where beach seines were banned by local fishers. The Fisheries Department has capitalised on such actions by encouraging the establishment of Beach Management Committees, similar to previous traditional institutions, which are encouraged to enforce fisheries regulations. The BMCs remain an informal institution, but the intention of the Fisheries Department is to formalise them and strengthen their role in management. A key conclusion would be that this approach is in line with contemporary approaches to multispecies small-scale fisheries and strengthening the legal and institutional capacity of BMCs would contribute to better management of the fishery.

Finally, the task of informing the selection of sites for more detailed field research to be carried out during the study was a key component of this review. The aim was to attempt to identify a small number of communities at a site that was representative of fisheries in Kenya. The limited number of sites was due to the very short duration of the study. The criteria and process used are described in part 5 and appendix 6. The outcome was that three communities (Chumani, Mtondia and Kidundu) in Kilifi district were selected from the sub-locations of Mtondia/Majaoni and Mdangarani.

7. References

Bakun, A., Roy, C. and Lluch-Cota, S. (1998). Coastal upwelling and other processes regulating ecosystem productivity and fish production in the Western Indian Ocean. In *Large Marine Ecosystems of the Indian Ocean: Assessment, Sustainability, and Management.* Edited by K. sherman, E. Okemwa and M. Ntiba. Oxford: Blackwell Press.

Bell, B.E. (1972). Marine fisheries. In *East Africa: its people and resources*. 1st edn, pp243-244. Edited by Morgan, W.T. London: Oxford University Press.

Brakel, W.H. (1980). Tidal patterns on the East African Coast and their implication for the littoral biota. Proceedings of the Symposium on the Coastal and Marine Environment of the Red Sea, Gulf of Aden and Tropical Western Indian Ocean. Vol. 2. UNESCO/ALESCO, Khartoum, Sudan p.403-418. tock

Brakel, W. (1984). Seasonal dynamics of suspended sediment plumes from the Tana and Sabaki rivers, Kenya: analysis of Landsat imagery. *Remote Sensing of the Environment*. 16: 165-173. tock

Cappo, M., Alongi, D., Williams, D. and Duke, N. (1998). A Review and Synthesis of Australian Fisheries Habitat Research. Volume 2. Issue 1: Natural Dynamics in Fisheries Habitats and Environmental Variability. Australian Institute of Marine Science.

Fulanda, B. and Motong;wa, H. (2001). Bottom shrimp trawling in Malindi: a preliminary survey of its impact on the artisanal fishery. Paper presented at the WIOMSA Symposium, Dar es Salaam, 22nd -25th October 2001.

Glaesel, H. (1997). Fishers, Parks and Power: The socio-environmental dimensions of marine resource decline and protection on the Kenyan coast. PhD Thesis. University of Wisconsin-Madison.

Government of Kenya (GK), 2000. Economic survey 2000. Central Bureau of statistics Ministry of Finance and Planning.

Habib, G. (2002). Kenya Fisheries sector Report and rationalisation paper . 82 pp (unpublished).

Hoorweg, J., Foeken, D. and Wijnand K. (1995). Seasons and Nutrition at the Kenya coast. Research series 7/ 1995. African studies center, Leiden. 136pp.

IOC. (2000). Guidelines for the study of shoreline change in the Western Indian Ocean Region. Manuals and Guides 40. UNESCO. Pp 55.

IUCN/UNEP. (1985). Conservation of coastal and marine ecosystems and living resources of the East African region. UNEP Regional Seas Reports and Studies. No.11. UNEP, Nairobi.

Iversen, S.A. (1984). Kenya marine fish resources in waters deeper than 10 m by R/v Fridtjof Nansen . Proceedings of the NORAD- KENYA seminar to reviewthe marine fish stocks and fisheries in Kenya. Mombasa , Kenya 13 – 15th March 1984.

Kamukuru, A.T. (1992). Costs and earnings of basket trap and handline fishery in the Dar-es-Salaam region of Tanzania. MsC Thesis submitted to University of Kupio, Finland.

Kemp, J. (2000). East Africa Marine Ecoregion Biological Reconnaissance. Annex 1. Report to WWF Eastern Africa Programme. 90pp.

King, A. (2000). Managing without institutions: the role of communication networks in governing resource access and control. PhD Thesis. University of Warwick, UK.

Malleret-King D. (2000). A Food Security Approach to Marine Protected Area Impacts on Surrounding Fishing Communities. PhD Thesis. University of Warwick, UK.

Malleret-King, D. (1996). Les systemes de productions des agriculture et pêcheurs de Biga, petite communaute de pêcheurs. DESS Développment Agricole - Memoire. Institut d'Etude du Developpement Economique et Social. Paris I. La Sorbonne.

McClanahan, T. (1995a). Fish predators and scavengers of the sea urchin *Echinometra mathaei* in Kenyan coral-reef marine parks. *Environmental Biology of Fishes*. 43, 187-193.

McClanahan, t. (1995b). A coral reef ecosystem-fisheries model, impacts of fishing intensity and catch selection on reef structure and processes. *Ecological Modelling* 80, 1-19.

McClanahan, T.R. (1988). Seasonality in East Africa's coastal waters. *Marine Ecology Progress Series*. 44: 191-199.

McClanahan, T.R., Glaesel, H., Rubens and J., Kiambo, R. (1996). The effects of traditional fisheries management systems on fisheries yields and the coral-reef ecosystems of southern Kenya. *Environmental Conservation* 24(2), 105-120.

McClanahan, T., Kamukuru, N., Muthiga, N., Gilagabher Yebio, M. and Obura, D. (1996). Effect of sea urchin reductions on algae, coral and fish populations. *Conservation Biology*. 10(1), 136-154.

McClanahan, T.R. and Mangi, S. (2001). The effect of closed a closed area and beach seine exclusion on coral reef fish catches. Fisheries Management and Ecology, 8. 107-121.

McClanahan, T.R. Muthiga, N.A. and S. Mangi. (2001). Coral and algal changes after the 1998 coral bleaching: interaction with reef management and herbivores on Kenyan reefs. *Coral Reefs*. 19:380-391.

McClanahan, T.R. and Obura, D. (1995). Status of Kenyan coral reefs. *Coastal Management* 23, 57-76.

McManus, J.W. (1997). Tropical marine fisheries and the future of coral reefs: a brief review with emphasis on SouthEast Asia. *Coral Reefs* 13.

Merton, R. (1957). Social Theory and Social Structure. New York: Free Press.

Ministry of Tourism and Wildlife (1989. Mombasa Marine National Park and Reserve Management Plan. Nairobi: Wildlife Conservation and Management Department. Wildlife Planning Unit.

Mueni, E. and Mwangi, J. (2001). A survey on the use of turtle excluder device in trawlers along the Kenyan coast, KWS technical series.

Mvoyi, C., Mavuti, K.M. and Kazungu, J. (2001). An assessment of nutrient loading. Eutrophication and plankton dynamics in two marine tidal creeks, Kenya: Mtwapa and

Shirazi creeks. Poster presented at the WIOMSA Symposium, Dar es Salaam, 22nd -25th October 2001.

Mwangi, S.N, Njoya, J., Kimathi, A., Emuria J., Tunje, S. and Nyawa M. (2001). Anthropogenic influence of water quality in Makupa creek, Kenya. Poster presented at the WIOMSA Symposium, Dar es Salaam, 22nd -25th October 2001.

Mwaura J.M., Wanyonyi, I. And Obura, D. (2001). Reef fisheries status and site use by fishermen in Diani, Kenya. Poster presented at the WIOMSA Symposium, Dar es Salaam, 22nd -25th October 2001.

Newell, B.S. (1957). A preliminary survey of the hydrography of the British East African Coastal Waters. Fishery Publication London. 9: 1-21.

Nzioka R.M. (1990). Fish yield of Kilifi coral reef in Kenya. *Hydrobiologia*. 208. 81-84.

Obura, D.O. 2001. Participatory Monitoring of Shallow Tropical Marine Fisheries by Artisanal Fishers in Diani, Kenya. *Marine Pollution Bulletin*. 42(12): 1264-1278.

Obura, D.O., Church, J., Mwadzaya, H., Wekesa, E. and N. Muthiga. 1998. Rapid assessment of coral reef biophysical and socioeconomic conditions in the Kiunga Marine National Reserve, Kenya: methods development and evaluation. Prepared for FAO and UNEP-Water Branch, Nairobi. 46pp.

Obura, D.O. 1999. Status report Kenya. In, Coral Reef Degradation in the Indian Ocean. Status report and project presentations. CORDIO/SAREC, Stockholm. p.33-36.

Obura, D.O., Muthiga, N.A. and M. Watson. 2000a. Kenya. In, Coral Reefs of the Indian Ocean: their ecology and conservation. T.R. McClanahan, C.R.C. Sheppard and D.O. Obura (eds.). Oxford University Press, New York. p.199-229.

Obura, D., Uku, J.N., Wawiye, O.P., Mwachireya, S and Mdodo, R. 2000b. Kenya, reef status and ecology. In Coral Reef Degradation in the Indian Ocean – status report 2000. D. Souter, D. Obura and O.Linden (eds.). Stockholm. p.25-34.

Obura, D., Suleiman, M., Motta, H. and Schleyer, M. 2000c. Status of coral reefs in East Africa: Kenya, Mozambique, South Africa and Tanzania. In, Status of Coral Reefs of the World: 2000. C.Wilkinson (ed.). Australian Institute of Marine Science, Townsville. p. 65-76.

Obura, D.O. 2001. Kenya. *Marine Pollution Bulletin*. 42(12): 1264-1278.

Rubens, J. (1996). An Analysis of the Benefits and Costs of Marine Reserve Regulations at Diani, Kenya. MSc dissertation. Department of Marine Science and Coastal Management, University of Newcastle, UK.

Samoilys, M. (1988). Abundance and species richness of coral reef fish on the Kenya coast: The effects of protective management and fishing. *Proc. Int. Coral Reef Symp.* 6, 2, 261-266.

Sanders, M. J., Gichere, S. G. and Nzioka, R. M. (1990). Report of Kenya marine fisheries sub-sector study. SWIOP. FAO.

Sanders, M. J., Sparre, P. and Venema S.C. (eds). (1988). Proceedings of the workshop on assessment of the fishery resources in the southwest Indian Ocean. Albion, Mauritius, September 14-25, 1987. Rome, FAO/UNDP/NORAD.

Semesi, A. (1998). Mangrove management and utilisation in East Africa. *Ambio* Vol 27, 8, 620-626.

Sheppard, C. (1999). Biodiversity patterns in Indian Ocean corals, and effects of taxonomic error in data. *Biodiversity and Conservation*. 7, 847-868.

UNEP. 1998. Eastern Africa atlas of coastal resources: Kenya. United National Environment Programme, Nairobi. 119pp.

Wakibya, J. G. 1995. The potential human-induced impacts on the Kenya seagrasses. In, Coastal Systems and Sustainable Development in Africa. UNESCO reports in marine science. No. 66: 176-187

Wanyonyi, I., Obura, D. and Malleret-King, D. (2003). Linking socio-economic monitoring to reef fisheries management. Poster presented at ITMEMS, Manilla, March 2003.

Watson, M. (1996) The role of protected areas in the management of Kenyan reef fish stocks. PhD thesis. University of York. Tropical Marine Research unit, Department of Biology.

WWF. 2002. Proceedings of the Eastern African Marine Ecoregion Visioning Workshop. WWF Eastern Africa.

8. Appendices

APPENDIX 1: INTERVIEW GUIDES FOR THE REVIEW

A. On Communities, demography and dependence on marine resources

LOCATION OR SUB-lOCATION:_____

Demographic details (population) in location or sub-location	Names of fishing communities (villages)	Size (Small e.g; Kinondo, Medium e.g. Shimoni, Large e.g. Kilifi town)	Identify main economic or livelihood activities in order of importance for each community or village	Source of information or reference

B. Governance of fisheries and access to capital

LOCATION OR SUB-LOCATION:_____

Name and place of operation of existing fisheries related groups (cooperative, self help group, society, etc…)	Role or aim of each the groups	Existing loan/credit schemes for fishermen, name of scheme and area or village of implementation - include details if possible	Traditional or informal marine resource management, name/description and area or village of implementation	Formal resoucre management programmes (e.g. marine reserve or park, fisheries management programme) - name of area of implementation	Source of information or reference

C. Resource use patterns

LOCATION:_____

Number of Fishers	Gear used in order of most to least fishers		Resource exploited (species or local names)		Assets/boat used	Geographic area fished - inshore, offshore or detail if possible		Women involved in which activities?	Source of Information or reference
	Kusi	Kaskazi	Kusi	Kaskazi		Kusi	Kaskazi		

APPENDIX 2: TENTATIVE RANKING OF DEPENDENCE ON FISHERIES RESOURCES OF COASTAL COMMUNITIES

District	Location	Sub-location	Identify main economic or livelihood activities in order of importance for each community or village (rank, where 1 is most important)									
			Fishing	Fish Trading	Crop Farming	Animal Farming	Quarrying	Sea Transport	Mangrove Cutting	Tourism	Small-scale business	Tentative ranking of dependence
Lamu												
Tana River	Kipini	Kipini	1	2	3					5	4	M
Malindi	Fundisa	Fundisa	2	3	1	1				4	5	M
Malindi	Gongoni	Gongoni	2	3	1	1				5	4	M
Malindi	Gongoni	Ngomeni	2	3	1	1				5	4	M
Malindi	Magarini	Mambrui	2	3	1	1				5	4	M
Malindi	Malindi	Sabaki	1		2	3						H
Malindi	Malindi	Shella	1	3						2		M
Malindi	?	Darkasi	1	2	3							H
Malindi	Watamu	Watamu	2	3						1		M
Malindi	Gede	Dabaso	2	4	1				3			M
Malindi	Gede	Mida	1	3					2			M
Kilifi	Matsangoni	Uyombo	1	1	2	2	3				4	M
Kilifi	Tezo	Roka	1	4	3	3	2					M
Kilifi	Tezo	Chumani	1	4	3	3	2					M
Kilifi	Tezo	Mtondia/ Majaoni	1	4	3	3	2				5	M
Kilifi	Kilifi Township	Sokoni	4	4	2	2				3	1	L
Kilifi	Kauma	Mdangarani	1	2	3	3			4		5	M
Kilifi	Kilifi Township	Mnarani	3	3	2	2				4	1	L
Kilifi	Takaungu/ Mavueni	Takaungu	1		2	2	4				3	M
Kilifi	Mtwapa	Shimo la Tewa	1	2	3	3	4					M
Mombasa		Bamburi	1	1		4				3	2	M
Mombasa		Junda	1	1	2						3	H
Mombasa		Birikani	1	1	3				2		4	M
Mombasa		Island (Old Port)Kisingo	1	1							2	H

Mombasa		Port Reitz	1	1	3						2	H
Mombasa		Likoni	1	1		2	3				4	M
Kwale	Waa	Kitivo	2	5	1	3	4				6	M
Kwale	Tiwi	Simkumbe	4	4	1		5			3	2	L
Kwale	Diani	Ukunda	2	2	3					1	4	M
kwale	Kinondo	Kinondo	2	3	1	1				4	5	M
Kwale	Kinondo	Gazi	1	2	3					4		M
Kwale	Msambweni	Vingujini	1	3	2	2						H
Kwale	Msambweni	Milalani	1	3	2	2						H
Kwale	Pongwe & Kidimu	Shimoni	1	2	3	3		5		6	4	L
Kwale	Pongwe & Kidimu	Wasini-Mkwiro	1	2	3			4		5		L
Kwale	Vanga	Kiwegu	2	3	1	1					4	H
Kwale	Vanga	Vanga	1	2	3	3					4	H

NOTE:

1. Small scale business = kiosks, shops, weaving, food selling, renting accommodation
2. Fish trading = bicycle men, fish fryers

Ranking dependence:

- **High**: if fishing ranked 1 or 2 and fish trading/farming/business are the only other activities mentioned by the informant
- **Medium**: if fishing was ranked 1, 2 and one income generating activity other than fish trading/farming/business (such as tourism, quarrying, transport) is mentioned by the informants
- **Low**: if fishing is ranked less than 1 and several other income generating activities. Or if fishing is ranked 4 or 5 even if no other income generating activities mentioned.

APPENDIX 3: ROLES AND OBJECTIVES OF IDENTIFIED FISHERMEN GROUPS

District	Location	Sub-location	3. Name, place of operation and number of members of existing fisheries related groups (cooperative, self help group, society, etc.)	4. Role or aim of each the groups	5. Details on the existing loan/credit schemes for fishermen
Lamu					
Tana River	Kipini	Kipini	Kipini Ecofriendly operates in Kipini and was formed in February 2002. Membership fee is not known, though there is one to qualify as member. Has 10 members. Do not have to be a fisher to become a member. A number of the members have expertise in mangrove and other indigenous forests.	Conservation of marine resources and endangered forests, including mangroves.	No loan scheme available to fishers.
Tana River	Kipini	Kipini	Kipini Community Conservation Group - KCCG operates in the Kipini sub-location. Group is registered and was formed and commenced in 1994. The group has 30 members (full time active members), which are supported by the community members in Kipini village. Membership fee is 400/-. Members includes fishers as well as other interested parties (e.g. hotelier, fish trader).	To oversee the proper management and conservation of the marine resource, including sea turtles and dugongs.	No loan scheme available to fishers.
Tana River	Kipini	Kipini	Kipini Fishermen Association operating in Kipini was established in January 2002, mainly composed of fishers. There are 20 members. To qualify as a member you have to be a fisher and pay 160/- .	Conservation of marines resources - corals and mangroves and deal with other beach management issues.	No loan scheme available to fishers.
Malindi	Fundisa	Fundisa	Fundisa Beach Management Committee operating in Fundisa, is composed of 6 members of each fisher group (listed above).	Role is to patrol the beach, take note of illegal fishing methods (e.g. undersized fish and mchupa/mkanga (traditional fish poison) and report to Fisheries Department or act on the law-breakers themselves.	No loan scheme available for fishers through BMC.

Malindi	Fundisa	Fundisa	There are 5 groups operating in the different fishing villages in the Fundisa sub-location. These groups are: (1) Jambiani fishermen Group; (2) Ondo Fishermen Group;(3) Kenya Ule Fishermen Group; (4) Soyosoyo fishing Club; (5) Jeza Zhomu fishermen Group. (1) has 30 members, is unregistered, and was formed in 2002, and is mainly working in Kibaoni Village. (2) has 20 members, is unregistered and was formed in 2002, and based in Marereni Village. (3) has 25 members, is registered and was formed in 2000, and is based in Kambi ya Waya Village. (4) has 50 members, is registered and was formed in 2001, and is based in Marereni. (5) has 20 members, is unregistered and was formed in 2001, and is based in Msumarini Village. For (4) one has to be a fisher to qualify as a member, pay 200/- (one-off payment). No information is available for the other groups.	Bring financial inputs together for economic advancement (each member gives 5/= per kg of fish caught) per day. Ensure proper conservation and management of the resources. Conservation of endangered species e.g.. Sea turtles and dugongs. (Future plans to do fish farming)	Soyosoyo Group: Members are required to pay 5/- per kilogram of fish catch to the Group, which is used to support the Group as well as to establish funds for a loan scheme. However, the loan scheme is not started, thus requirements to obtain a loan have not been determined. Also, members have not been giving the 5/- per kg fee to the Group.
Malindi	Gongoni & Magarini (note: information has been collected for 3 sub-locations in 2 locations)	Gongoni, Ngomeni, Mambrui	Mkunazini Fishermen Group is a registered group operating in Ngomeni Village. The group was formed and began operating in 2001. To become a member one has to pay a membership, and is living inside the village (note if the fisher originally comes from another area, but is residing NOW in Ngomeni, he qualifies for the Group). There is a membership fee of 200/-.	Development of fisheries Promote economic development of members. Promote unity among members. Promote sustainable management/conservation of the resources. Manage a small loan scheme on behalf of its members.	10% of the daily income of each fisher earned through fishing goes to the Group. The loan system has not begun yet, because there is still insufficient funds to commence, and the 10% collection from fishers has not commenced. No rules have been established for how the fund would operate. There is a reluctance from fishers to provide 10% of their income to the fund.
Malindi	Malindi	Sabaki & Shella	Malindi Fishermen Cooperative Society operating in Sabaki & Shella sub-locations.	Facilitate fish marketing for the members	No loan scheme for fishers.
Malindi	Malindi	Sabaki & Shella	Mijikenda Fishermen Association	To facilitate fish marketing for the members	No loan scheme for fishers.

Malindi	Malindi	Sabaki & Shella	Malindi Vigilant Group (Malindi) operating in Sabaki & Shella sub-locations.	Its role is to police marine areas to curb any illegal use of gears and fishing methods, and to promote conservation.	No loan schemes for fishers.
Malindi	Malindi	Shella	Vasco da Gama Beach Management Committee operating in Shella sub-location.	Its role is to police marine areas to curb any illegal use of gears and fishing methods, and to promote conservation.	No loan schemes for fishers.
Malindi	Malindi	Sabaki	Sabaki BMC operating in Sabaki sub-location.	Its role is to police marine areas to curb any illegal use of gears and fishing methods, and to promote conservation.	No loan schemes for fishers.
Malindi	Watamu & Gede (note: information is for 2 sub-locations in 2 locations)	Watamu & Jimba	Watamu Vigilant Group (Watamu) operating in Watamu & Gede area. The group is made up of local fishers from the area.	Its role is to police marine areas to curb any illegal use of gears and fishing methods, and to promote conservation.	No loan schemes for fishers.
Malindi	Watamu & Gede (note: information is for 2 sub-locations in 2 locations)	Watamu & Jimba	Watamu Beach Management Unit Committee operating in Watamu & Gede sub-locations. The WBMUC has its membership from the 6 groups listed above.	Has rules to be followed by all members to ensure sustainability of the resource, patrol the beach taking note of illegal fishing methods and report to the Fisheries Dept.	No loan schemes for fishers.
Malindi	Watamu & Gede (note: information is for 2 sub-locations in 2 locations)	Watamu & Jimba	There are 5 groups operating in Watamu & Gede Sub-locations. (1) Watamu Muungano Fishermen Group (Watamu), (2) Dabaso Mangrove Conservation Group (Dabaso), (3) Jipemoyo Mangrove Conservation Group, (4) Sita Mangrove Conservation & Fishermen Group, (5) Mayungu Fishermen Association.	Conservation of the marine resources, particularly mangroves and the fisheries resources.	None of the groups have loan schemes for their members.

Malindi	Watamu & Gede (note: information is for 2 sub-locations in 2 locations)	Watamu	Watamu Turtle Watch Group.	Education and awareness of sea turtle conservation issues with school children, local communities. Also work with fishers in relation to turtle issues - e.g. protection of nests (fishers get paid when they find a turtle nest), and are doing some basic socio-economic data collection with communities in the area.	None available for local fishers.
Kilifi	Matsangoni	Uyombo	Uyombo Beach Management Committee operates in Uyombo sub-location. Unknown the number of members. Not know how fishers qualify for membership.	Promote good use of the resources, including appropriate and sustainable fishing gear. In partnership with Department of fisheries, the BMC's role is to assist with the policing their area to ensure compliance with Fisheries legislation (e.g. mainly to do with gear types, destructive fishing practices)	No loan scheme available to fishers.
Kilifi	Tezo	Mtondia/ Majaoni	Bofa Beach Management Committee operates in Mtondia/Majaoni sub-location, based out of Bofa landing site. Unknown the number of members. Not know how fishers qualify for membership.	Promote good management of marine resources including the use of appropriate and sustainable fishing methods. In partnership with Department of fisheries, the BMC's role is to assist with the policing their area to ensure compliance with Fisheries legislation (e.g. mainly to do with gear types, destructive fishing practices)	No loan scheme available to fishers.
Kilifi	Tezo	Mtondia/ Majaoni	Bofa Bunduki Fishers Group (unregistered operates in Mtondia/Majaoni sub-location.). Unknown the number of members. Not know how fishers qualify for membership.	Fight for the rights of speargun fishers.	No loan scheme available to fishers.

Kilifi	Township	Sokoni	Fishers have not formed any groups. However, there used to be the Kilifi Fishermen co-operative Society which reportedly ceased to operate due to mismanagement.	N/A	No existing loan scheme at present. However, the defunct Kilifi Fishermen Cooperative Society had one of its roles as economic development of the fishers. None of the fishers admitted having benefited from any cooperative loan.
Kilifi	Kilifi Township	Mnarani	Fishers have not formed any groups. However, there used to be the Kilifi Fishermen co-operative Society which reportedly ceased to operate due to mismanagement.	N/A	No existing loan scheme at present. However, the defunct Kilifi Fishermen Cooperative Society had one of its roles as economic development of the fishers. None of the fishers admitted having benefited from any cooperative loan.
Kilifi	Takaungu/ Mavueni	Takaungu	Takaungu Beach Management Committee operates Takaungu sub-location. Unknown the number of members. Not know how fishers qualify for membership.	Improve fishing and marketing of fish, provide a loan system for members, and ensure the sustainable utilisation of resources. In partnership with Department of fisheries, the BMC's role is to assist with the policing their area to ensure compliance with Fisheries legislation (e.g. mainly to do with gear types, destructive fishing practices)	No loan schemes available to fishers, even though this is one if its aims and it has been proposed. No fees have been collected so far for proposed loan scheme.
Kilifi	Mtwapa	Shimo la Tewa	Mtwapa Fishermen Union operates in Shimo le Tewa sub-location.. Unknown the number of members. Not know how fishers qualify for membership.	To keep money together to buy nets and vessels to support local fishers.	To date, no money has been collected from its members for the purpose of buying nets and vessels.
Mombasa		Bamburi	Bamburi Beach Management Committee (unregistered) operates in Bamburi. All local fishers of the area qualify as a member. Unable to determine size of BMC.	BMC is in its early stages of formation, so no role/aims defined yet.	No loan scheme available for fisher members.

Mombasa		Bamburi	Majaoni Fish Friers Women Group (formal name) operate in both Majaoni and Bamburi. There are 20 members. You have to be a woman, and pay a registration fee to become a member, and then a monthly fee (unknown amount).	To provide a credit/loan scheme to their members.	Save together and advance loans to members to meet their financial needs. Depends on the nature of the problem as to who gets funds within their group. The group has a chairman, secretary and treasurer to manage their fund. This only benefits fishers whose wives are part of this scheme - but it is unknown how many of the women are married to local fishers from the area.
Mombasa		Junda	Mishomoroni Fishermen (no formal name) operating in Mishomoroni only. 35 members. If you fish you qualify as a member	Fetch a better market for their fish.	No loan scheme available for members.
Mombasa		Birikani	Mikindani Fishermen (no formal name) operate in Mikindani. There are 40 members (unregistered). Anyone can become a member if they provide monthly fee (unknown amount).	Advance credit to members especially in cases of emergency.	Members of the scheme pay a monthly fee (unknown amount) to the 'beach leader' of the group who manages the fund. Each month, the whole sum of money collected is given to directly to one individual fisherman. This system is rotated so that everyone gets a lump sum of money for their own use (no specifications/limitations on the use of the money, but usually it is for medical expenses, school fees, etc.). However, in an emergency, a member can access this money ahead of his turn, provided he has the approval of the actual person who was supposed to get the money, and he has a legitimate reason.

Mombasa		Island (Old Port)/Kizingo	Old Port Fishermen (unregistered, with no formal name). Have 30 members who operate in the Old Port area. Qualify as a member if you are a fisher in the area.	To access a better markets for their fish.	Fishers have an informal relationship with fish dealers (no papers signed) who grant soft loans to fishers in the low season in exchange for fish supplies during the better season. This does not have anything to do with the 'organisation' and is based on personal relationship with dealers built up over time.
Mombasa		Port Reitz	Port Reitz Beach Management Committee (unregistered), operating in Port Reitz.48 members. If you fish in the area you qualify as a member.	Fetch a better market for their fish.	No loan scheme available for members.
Mombasa		Likoni	Mombasa Fishermen Cooperative Society is registered and has a certificate from the Department of Cooperatives. There are about 56 members. You need to pay a membership fee and a commission (% of your catch brought in). Membership dictates that you bring your catch to a specified landing site, to ensure catches are weighed and the correct commission is paid. The Cooperative also sells other food (e.g. unga) at the landing site to generate extra revenue for their group.	Cooperative - aims to harmonise marketing to obtain good prices for fish and maximize profits ofr both its members and itself. If the Society makes sufficient profits in any given year, bonuses are given (evenly) to all their members.	Just applied for a Community Development Trust Fund grant but not yet approved. The Cooperative has to raise 25% of funds requested and provide proof of benefits to community to be eligible for the grant.
Mombasa		Likoni	Likoni Beach Management Committee. You need to be a fisher in the areas to qualify for the membership. Some BMC members are Cooperative members too, provided they pay the fees for the Cooperative.	BMC is still less than a year old and have not established its aims/role. The relationship between the Cooperative have not been clearly defined.	No loan scheme available for members.
Kwale	Waa	Kitivo	No fisher groups identified	N/A	No existing loan scheme identified
Kwale	Tiwi	Simkumbe	No fisher groups identified	N/A	No existing loan scheme identified
Kwale	Diani	Ukunda	Diani Beach Management Committee operates in Unkunda sub-location, under the umbrella of SCOFEC (see description SCOFEC above)	Management of marine resources in area and collecting fees from visiting fishers.	No loan schemes. Money collected from visitor fees goes to the running of BMC.

Kwale	Kinondo	Kinondo	There are two main group. Chale Fishermen Group (Chale) operates in Kinondo. Mwaepe Fishermen Group (Mwaepe) operates in the Mwaepe Village in Kinondo.	To improve members economic status by looking for financial/equipment assistance for the members. Fight for the proper management and conservation of the resources in liaison with the Dept of Fisheries and other stakeholders.	No loan scheme available for fishers.
Kwale	Kinondo	Gazi	No fisher groups identified	N/A	No existing loan scheme identified
Kwale	Pongwe/Kidimu	Wasini/Mkwiro & Shimoni	There are four groups operating in the Wasini/Mkwiro & Shimoni sub-locations. These groups are (1) Kalole (Mkwiro), (2) Shimoni Community Initiative (Shimoni), (3) Mazingara ya Uvuvi Group (Shimoni), (4) Majoreni fishermen Co-op (Majoreni). All 4 groups operate under the umbrella of South Coast Fishermen Environmental Committee (SCOFEC) (south coast region). SCOFEC is mainly concerned with the issues relating to the improved management of marine resources, and includes representatives from each of the four groups listed above, Department of Fisheries officers, and other stakeholders (e.g. hoteliers). Unknown the number of members. Not know how fishers qualify for membership.	Environmental conservation and sustainable utilisation of their resources. Economic aims include increasing the bargaining power of fishers and improved marketing of their fish. Participatory fish catch data collection is undertaken by selected members of the group for all fishers in the area, on behalf and with training from the Department of Fisheries.	No loan schemes available to fishers.
Kwale	Msambweni	Vingujini & Milalani	Msambweni Fishermen Youth Group operates in Vingujini and Milalani sub-locations. Unknown the number of members. Not know how fishers qualify for membership.	Fish marketing and collecting a commission from local fishermen to form a small revolving fund.	The revolving fund works in the following way - money is collected and given to one fisher at a time, such that everyone gets a turn at receiving the money. However, while the money has been collected (unknown for how long), the scheme has not commenced and therefore no one has benefited from the fund.

Kwale	Msambweni	Vingujini & Milalani	Ujenzi Kaya group (unregistered) operates in Vingujini and Milalani sub-locations. Unknown the number of members. Not know how fishers qualify for membership.	Fish marketing and collecting a commission from local fishermen to form a small revolving fund.	The revolving fund works in the following way - money is collected and given to one fisher at a time, such that everyone gets a turn at receiving the money. However, while the money has been collected (unknown for how long), the scheme has not commenced and therefore no one has benefited from the fund.
Kwale	Vanga	Vanga & Kiwegu	Magugu Fishermen Cooperative Society (in Vanga village) operating in Vanga & Kiwegu sub-locations. Unknown the number of members. Not know how fishers qualify for membership.	To improve the economic welfare of the fishers by providing a small loan scheme, and to assist with the auction of fish to dealers and collection of commissions..	Commissions are collected from local fishers to operate a small loan scheme for the group. However, money has been collected but no loans have been given to any of its members. There has been some difficulty in getting members to pay the commission.
Kwale	Vanga	Vanga & Kiwegu	Vanga Beach Management Committee operates in Vanga & Kiwegu sub-locations.	Aim of the group is to improve beach cleanliness and curbing the use of illegal gears in the area.	No loan scheme available for fishers.
Kwale	Vanga	Vanga & Kiwegu	SCOFEC (see description above).	"as above"	"as above"

APPENDIX 4: KENYA MARINE FISH LANDINGS

Table: Kenya Marine fisheries catch in MT from 1999 to 2000 (*Source*: Fisheries statistics compiled by E. Mueni and J. Muturi from the Fisheries Department)

MARINE FISH	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Av. 91-2000
RABBIT FISH	708	495	440	365	387	404	347	356	305	299	410.6
SCAVENGERS	666	477	441	353	396	433	361	412	359	334	423.2
SNAPPERS	241	156	130	116	112	147	144	106	153	120	142.5
PARROT FISH	313	177	166	176	172	187	166	143	149	166	181.5
SURGEON FISH	55	36	28	25	22	21	17	31	22	29	28.6
URNICORN FISH	16	34	19	20	17	15	13	21	15	18	18.8
GRUNTER	95	60	64	52	68	65	72	55	78	63	67.2
POUTER	103	94	86	64	91	106	98	128	99	104	97.3
BLACK SKIN	108	64	68	68	58	60	63	52	63	60	66.4
GOAT FISH	38	36	32	41	31	30	30	23	46	40	34.7
STREAKER	31	21	19	20	20	18	17	35	33	26	24
ROCK COD	126	79	85	80	85	91	71	72	81	74	84.4
CAT FISH	39	34	36	28	31	40	44	53	46	40	39.1
MIXED DEM.	523	417	378	392	396	388	395	359	404	401	405.3
UNACC.FOR	459	327	299	270	283	299	276	281	277	266	303.7
CAVALLA JACKS	175	142	68	73	76	82	111	86	99	85	99.7
MULLETS	156	118	117	108	127	151	120	107	146	181	133.1
LITTLE MACK.	110	76	46	103	74	93	69	139	120	94	92.4
BARRACUDA	99	53	27	55	65	54	54	71	107	83	66.8
MILK FISH	24	19	27	27	27	24	24	32	26	26	25.6
KING FISH	84	72	44	42	89	79	63	60	76	71	68
QUEEN FISH	46	38	23	29	46	42	37	43	42	54	40
SAIL FISH	85	73	49	101	85	74	53	38	84	80	72.2
TUNNY	57	71	72	150	116	108	114	98	108	86	98
DOLPHIN	15	21	11	15	30	17	18	15	14	10	16.6
MIXED PEL.	148	102	61	58	110	145	151	127	126	150	117.8
UNACC.FOR	150	118	86	114	127	130	122	122	142	138	124.9

SHARKS/RAYS	262	173	154	166	176	191	140	134	132	115	164.3
SARDINES	337	357	163	162	112	218	187	155	150	119	196
MIXED/OTHERS	847	1962	388	424	711	980	832	1419	478	358	839.9
UNACC. FOR	217	374	106	113	151	208	174	256	114	89	180.2
LOBSTERS	60	52	46	44	119	177	136	38	53	52	77.7
PRAWNS	523	388	208	379	207	378	490	774	576	458	438.1
CRABS	77	57	69	59	71	111	100	117	136	166	96.3
UNACC.FOR	99	75	49	72	60	100	109	139	115	101	91.9
OYSTERS	10	13	17	8	14	39	16	9	10	2	13.8
OYSTERS (GR)	0	0	15	41	56	15	0	0	0	30	15.7
BECHE-DE-MER	79	226	79	106	460	117	41	8	14	106	123.6
OCTOPUS	120	49	33	57	345	388	393	155	168	42	175
SQUIDS	56	56	117	328	372	82	317	30	36	27	142.1
Total	7357	7192	4366	4904	5995	6307	5985	6299	5202	4763	5837

APPENDIX 5: MARINE FISH LANDINGS PER DISTRICT (*Source*: Fisheries statistics compiled by E. Mueni and J. Muturi from the Fisheries Department)

Table 1: Lamu District Marine fisheries catch in MT from 1991 to 2000

MARINE FISH/Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Average
RABBIT FISH	236.3	245.3	261.9	168.3	101.6	198.1	151.1	177.6	138.3	132.8	181.13
SCAVANGERS	283.7	266.8	291.1	180.2	177.6	181	152.8	206.4	130.8	145.8	201.62
SNAPPERS	61.7	70.2	64.3	41.2	178.9	47.2	48.7	37.1	39.5	35.9	62.47
PARROT FISH	37.7	34.7	46.6	42	38.5	40.7	35.6	44.2	50.8	60.8	43.16
SURGEON FISH	3.8	6	5.5	4.5	39.5	5.9	2.1	10	9.7	8.4	9.54
URNICORN FISH	1.6	12.6	0.2	0.15	4	0.05	1.9	0	3.3	2.9	2.67
GRUNTER	43.8	34.6	44.7	24.3	0.032	32.4	30.8	17.3	20.9	21.1	26.9932
POUTER	36.2	39.1	44.3	17.1	22.3	30.7	25.8	28.7	29.2	29.1	30.25
BLACK SKIN	26.5	26.4	39	33.4	26.2	34.5	34.7	22.7	25.6	23.2	29.22
GOAT FISH	13.7	16.6	14.2	10.5	32.5	8.7	8	6.5	17.2	13.4	14.13
STREAKER	0.86	5.8	1.7	0	7	0	1.5	0	1.5	1.9	2.026
ROCK COD	34.5	31.4	39.6	25.9	0	27	23.6	22.4	26.4	17.2	24.8
CAT FISH	8.2	8.2	14	7.9	22.5	17.2	17.5	23	18.5	12.7	14.97
MIXED DEM.	170.3	162.2	148	16.4	8.4	165.3	152	145.2	125.8	118.1	121.17
UNACC.FOR	143.9	144	152.3	108	149.2	118.3	101.4	111.2	95.7	93.5	121.75
CAVALLA JACKS	24	24.8	27	18.1	18.6	19.6	19.5	11.9	23.5	25.7	21.27
MULLETS	54.1	52.9	55.3	49.8	59.9	70.3	52.2	35.9	43.4	59	53.28
LITTLE MACK.	5	0.2	0.18	0.5	0	0.62	0.12	0	4	1.3	1.192
BARRACUDA	22.7	19.7	23.7	11	12.8	13	6	6.7	11.9	10.9	13.84
MILK FISH	2.7	5.4	5.9	2.9	17.1	0.97	0.4	0.8	7.3	1.5	4.497
KING FISH	2.3	11.5	1.3	0.88	0.44	1.6	1.2	0.5	1.8	2.7	2.422
QUEEN FISH	0.07	0.7	0.6	0.19	2.1	0.48	2.1	0	1.3	1.1	0.864
SAIL FISH	0.7	1.9	1.3	5.3	0.33	2.3	0.5	0	3.3	0.23	1.586
TUNNY	5.3	5.4	4	5.4	2.7	6.3	2.8	0	0.8	2.4	3.51
DOLPHIN	0	1.2	0	0	0	0	0.3	0	0	0	0.15
MIXED PEL.	2.1	4.6	1.7	0.37	0.7	1.2	3.5	0	5.1	7.7	2.697
UNACC.FOR	17.9	19.3	18.1	14.1	14.9	17.5	13.3	8.3	15.4	16.9	15.57

SHARKS/RAYS	32.1	33.5	24.4	30.1	13.3	11.9	11.5	6.3	25.1	8.7	19.69
SARDINES	0.2	0.06	1.6	0	0	0.48	0	3	0	0	0.534
MIXED/OTHERS	31.3	18.4	22.5	5.5	0.2	0	0	0	0	0	7.79
UNACC. FOR	9.5	7.8	18.1	5.3	2	1.8	1.7	1.4	3.7	1.3	5.26
LOBSTERS	31.2	31.4	20.9	17.9	19.1	19.5	21.3	13.7	19.9	25.1	22
PRAWNS	8.9	13.4	12.3	6	3.5	8.1	9.1	8.4	7.1	13.7	9.05
CRABS	28.6	24.6	2.3	17.1	16.1	26.9	35.6	44.3	47.6	83	32.61
UNACC.FOR	10.3	10.4	8.4	6.1	5.8	8.1	9.9	9.9	11.2	182.9	26.3
OYSTERS	0.5	0.2	0.15	0	0	0.26	0.3	0	0	0.015	0.1425
BECHE-DE-MER	0	2.5	2.3	3.4	2.1	2	3.8	0.48	2.7	10.9	3.018
OCTOPUS	0.22	0.6	0.07	0.6	0.41	1.8	0.1	0	0	0.58	0.438
SQUIDS	0.3	0.16	0.007	0.47	0	1.1	0	0	0	0.27	0.2307
TOTAL	1392.75	1394.52	1419.507	880.86	1000.312	1122.86	982.72	1003.88	968.3	1172.695	1133.84

Table 2: Tana River District Marine fisheries catch in MT from 1991 to 2000

MARINE FISH/Year	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Average**
RABBIT FISH	0.032	0.122	0.045	0	0.4	0.5	0.027	0.63	0.38	527.2	52.9336
SCAVANGERS	0	1	0	0	0.2	0.2	0	0	0	1.2	0.26
SNAPPERS	4.5	0.22	0.7	0.5	0.7	0.3	0.77	0.6	0.7	0.24	0.923
PARROT FISH	0	0	0	2.5	0.2	2.6	0.43	0.3	0.37	0.5	0.69
SURGEON FISH	0	0	0	0	0	0	0	0	0	0.61	0.061
URNICORN FISH	0	0	0	0	0	0	0	0	0	0	0
GRUNTER	0	0	0	0	0	0	0	0	0	0	0
POUTER	0	0	0	0	0	0	0	0	0	0	0
BLACK SKIN	0	0	0	0	0	0	0	0	0	0	0
GOAT FISH	0	0	0	0	0	0	0	0	0	0	0
STREAKER	0.093	0	0	0	0.01	0	0	0	0	0	0.0103
ROCK COD	0.04	0.28	0	0	0.22	0.06	0	0	0	0.16	0.076
CAT FISH	2.6	8.4	2.3	2.6	3.3	2.8	2.5	4.2	2.7	2	3.34

MIXED DEM.	1.8	4.1	2	1.7	2.3	4	1.1	2.2	2.2	3.3	2.47
UNACC.FOR	4.3	2.1	0.7	1.1	1.1	1.6	0.7	1.2	0.9	1.2	1.49

CAVALLA JACKS	0.32	0.2	0.09	0.09	0.3	0.4	0	0.14	1.5	1.4	0.444
MULLETS	1	0.72	0.38	0.46	0.5	0.9	1.1	2.9	0.9	1.1	0.996
LITTLE MACK.	0	0	0	0	0	0	0	0	0	0	0
BARRACUDA	0.033	0	0	0	0.01	0	0	0	0.02	0	0.0063
MILK FISH	0	0	0.025	0	0.05	0	0	0	0	0	0.0075
KING FISH	0.03	2.3	0.23	0.45	1.5	0.7	0	0.14	0.3	0.8	0.645
QUEEN FISH	0.76	0.8	0.54	0.68	0.8	0.25	1	0.4	2	1.2	0.843
SAIL FISH	0	0	0	0	0	0	0	0.05	0	0	0.005
TUNNY	0.5	1.3	0	0	0	0	0	0	0	0	0.18
DOLPHIN	0	0	0	0	0	0	0	0	0	0	0
MIXED PEL.	1	1.8	0.1	0	0	0	0	0	0.17	0	0.307
UNACC.FOR	0.5	1.1	0.21	0.25	0.48	0.3	0.33	0.5	0.74	0.7	0.511

SHARKS/RAYS	1.5	2.1	3.5	2.9	1.1	2.1	1.1	3.3	4	6.8	2.84
SARDINES	0.087	0	0	0	0	0	0	0	0	0	0.0087
MIXED/OTHERS	3	2.9	10.5	14	2.2	3.9	7.2	3.6	5.9	4.7	5.79
UNACC. FOR	0.7	0.7	0.2	2.5	0.5	0.9	1.3	1	1.4	1.7	1.09

LOBSTERS	1.5	2.5	1	1.7	0.6	0.2	0.27	1.1	2	1.8	1.267
PRAWNS	1.5	1.5	4.8	2.6	1.5	1.8	4.2	2.4	4.7	9.9	3.49
CRABS	0.35	1.5	2.7	2.1	0.2	0.4	1	0	2.4	0.9	1.155
UNACC.FOR	0.51	0.8	1.2	0.9	0.3	0.3	0.8	0.5	1.3	1.9	0.851

OYSTERS	0	0	0	0	0	0	0	0	0	0	0
BECHE-DE-MER	0	0	0	0	0	0	0	0	0	0	0
OCTOPUS	0	0	0	0	0	0	0	0	0	0	0
SQUIDS	0	0	0	0	0	0	0	0	0	0	0

TOTAL	26.655	36.442	31.22	37.03	18.47	24.21	23.827	25.16	34.58	569.31	82.6904

Table 3: Malindi District Marine fisheries catch in MT from 1991 to 2000

MARINE FISH/Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Average
RABBIT FISH	101.1	111.7	79.7	112	105.8	91.4	79.6	40.7	31.8	40.6	79.44
SCAVANGERS	79	68.8	57.6	67.7	96.2	96.7	78.9	60.3	61.6	40.6	70.74
SNAPPERS	9.7	19.4	19.3	28.4	46.6	36.8	29.4	32.8	36.7	18	27.71
PARROT FISH	34.6	28	26.7	79.5	27.7	34.6	24.5	8.1	9.7	6.5	27.99
SURGEON FISH	10.3	15.5	9.8	9.4	7	4.3	4.5	4.1	2	2.1	6.9
URNICORN FISH	2.9	11.6	8.6	9	7.9	6	3.5	5.5	1.4	2.4	5.88
GRUNTER	7.8	9.2	9.7	12.3	15.3	6.4	5	2.4	4.5	2.9	7.55
POUTER	2	6.7	4.2	0.8	11.8	17.5	7.8	0.03	1	1.3	5.313
BLACK SKIN	18.8	14.9	9.9	10.6	5.8	5.6	3.8	2.9	6.1	3.8	8.22
GOAT FISH	1.5	2.8	3.1	7	5	3.8	2	0.76	1	0.5	2.746
STREAKER	6.9	9	11	9.2	9.2	7.1	3.4	3.3	2.5	1.6	6.32
ROCK COD	23.4	19.3	21.1	32.8	28.5	24	22.4	13.9	16.4	13.5	21.53
CAT FISH	9.2	5.8	11	10.4	9.8	8.3	8.6	12.2	11.6	10.9	9.78
MIXED DEM.	67.9	79.3	73.2	88.7	101.3	110.6	130.1	97.5	101.8	74	92.44
UNACC.FOR	56.2	60	51.7	65.4	68.8	68	60.6	42.7	43.2	32.8	54.94
											0
CAVALLA JACKS	14.3	36.7	16.8	19.9	15.2	14.4	11.2	10.5	7.8	12.9	15.97
MULLETS	22.8	23.4	24.3	19.4	24.9	20.7	11.6	10.1	27.5	24.3	20.9
LITTLE MACK.	12.7	16.2	8.2	38.2	16.6	30.9	7.8	5.5	8	2.1	14.62
BARRACUDA	13.8	9.3	12.7	18.7	20.6	12.7	19	12.7	15.9	6.4	14.18
MILK FISH	5.2	8.1	15.4	19.1	15.8	12.3	14.1	13.6	7.6	8.2	11.94
KING FISH	43.3	45.8	32.5	30.5	20.4	41.8	26.2	13.1	26.6	33.7	31.39
QUEEN FISH	20.9	26.7	13.1	21	59.6	15.5	8.8	3.2	4.3	22	19.51
SAIL FISH	74.1	65.3	40.9	80.9	72.7	54.6	44.2	26.2	52.6	52.7	56.42
TUNNY	35.7	54.7	60.4	132.6	101.6	80.2	62.1	39.1	41.8	47.7	65.59
DOLPHIN	11.3	12.9	6.5	1.1	22.3	8.6	10.1	7.3	7.1	3.3	9.05
MIXED PEL.	35.9	34.8	26.8	18.6	46.5	44.6	46.9	59.5	49.1	61.1	42.38
UNACC.FOR	42	50.1	38.6	61.6	62.5	50.5	39.8	30.2	37.3	45.7	45.83
SHARKS/RAYS	66.4	65.9	65.7	73.6	97.6	88.4	60.5	47	32.5	42.3	63.99
SARDINES	74.8	26.5	56.9	52	32.3	83.8	48.5	15	11.1	9.2	41.01
MIXED/OTHERS	57.6	64.7	69.3	59.3	55	43.7	22.2	13.4	18.6	48.2	45.2

UNACC. FOR	29.8	23.6	38.6	27.7	27.7	32.4	19.6	11.3	9.3	14.9	23.49
LOBSTERS	14.3	11.8	17.6	13.1	14.8	20	12.9	5.8	8.7	4.8	12.38
PRAWNS	25	29.8	36	22	23.8	21.4	40.6	22.1	20.7	12.8	25.42
CRABS	19	21.8	28.1	23.3	17.5	24.9	14.1	11.5	12.6	24.9	19.77
UNACC.FOR	8.8	9.5	12.3	8.7	8.4	9.9	10.1	5.9	6.3	6.3	8.62
OYSTERS	2.3	4.6	13.7	5.2	11.8	29.5	13.6	1.2	4.1	1.7	8.77
BECHE-DE-MER	0.1	0.9	0.7	0.45	11.9	1.7	4.2	1.1	0	0	2.105
OCTOPUS	18.2	14.2	17.8	20.4	29.2	16.8	19.4	15.9	26.5	6.8	18.52
SQUIDS	7.8	9.8	8.3	10.2	5.5	1.9	2.8	1.3	28.6	1.8	7.8
TOTAL	1087.4	1129.1	1057.8	1320.75	1360.9	1282.3	1034.4	709.69	795.9	745.3	1052.354

Table 4: Kilifi District Marine fisheries catch in MT from 1997 to 2000 (only 3 years data available)

MARINE FISH/year	**1998**	**1999**	**2000**	**Average**
RABBIT FISH	31.5	17.7	16.7	22.0
SCAVANGERS	16.4	9.9	9.2	11.8
SNAPPERS	8.0	4.1	3.6	5.2
PARROT FISH	14.0	8.8	11.6	11.5
SURGEON FISH	3.6	1.2	0.4	1.7
URNICORN FISH	3.5	1.1	0.4	1.7
GRUNTER	5.4	5.8	4.8	5.3
POUTER	9.3	4.8	7.4	7.2
BLACK SKIN	2.5	1.8	1.3	1.9
GOAT FISH	2.1	1.6	0.8	1.5
STREAKER	0.1	0.9	0.3	0.4
ROCK COD	2.9	2.3	1.9	2.4
CAT FISH	0.2	0.2	0.2	0.2
MIXED DEM.	12.2	2.1	24.4	12.9
UNACC.FOR	16.8	12.3	12.5	13.9
CAVALLA JACKS	9.6	7.1	3.4	6.7
MULLETS	10.7	10.4	12.6	11.2

LITTLE MACK.	24.4	20.2	7.1	17.2
BARRACUDA	7.9	5.4	2.1	5.1
MILK FISH	0.8	0.3	0.2	0.4
KING FISH	5.3	6.5	2.0	4.6
QUEEN FISH	4.1	1.8	2.3	2.7
SAIL FISH	4.7	12.4	2.2	6.4
TUNNY	30.9	26.3	5.3	20.8
DOLPHIN	2.0	1.4	0.6	1.3
MIXED PEL.	3.5	11.2	2.3	5.7
UNACC.FOR	15.6	15.5	6.0	12.4
SHARKS/RAYS	6.4	6.0	5.1	5.8
SARDINES	24.6	43.1	15.2	27.6
MIXED/OTHERS	30.1	9.9	6.7	15.6
UNACC. FOR	9.1	8.8	4.0	7.3
LOBSTERS	1.6	1.4	1.1	1.4
PRAWNS	5.1	2.5	2.6	3.4
CRABS	0.0	0.1	0.1	0.1
UNACC.FOR	1.0	0.6	0.5	0.7
OYSTERS	7.3	6.3	1.7	5.1
BECHE-DE-MER	0.0	0.0	0.0	0.0
OCTOPUS	41.5	17.3	6.7	21.8
SQUIDS	1.2	0.5	1.9	1.2
TOTAL	375.9	289.5	187.2	284.2

Table 5: Mombasa District Marine fisheries catch in MT from 1991 to 2000

MARINE FISH/Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Average
RABBIT FISH	283.1	61.0	45.8	36.6	44.6	31.8	30.7	30.2	29.9	36.1	63.0
SCAVANGERS	215.6	51.1	34.1	31.4	51.0	42.3	39.2	37.4	38.8	44.4	58.5
SNAPPERS	104.1	19.0	12.3	7.9	10.4	15.5	8.6	12.5	17.5	8.9	21.7

PARROT FISH	157.8	54.4	42.8	49.5	51.9	42.4	22.0	29.2	22.5	32.6	50.5
SURGEON FISH	266.2	4.7	3.7	1.7	1.3	1.4	1.4	0.5	0.8	1.8	28.4
URNICORN FISH	3.7	1.8	2.6	4.0	0.8	0.0	0.2	0.6	1.7	1.8	1.7
GRUNTER	25.8	6.9	3.2	3.7	20.7	14.2	10.5	11.9	17.5	16.0	13.0
POUTER	30.1	11.4	8.8	6.2	19.8	16.3	12.8	43.7	19.2	20.5	18.9
BLACK SKIN	16.2	1.3	1.3	1.3	1.7	1.2	0.4	1.2	1.5	1.4	2.8
GOAT FISH	1.5	0.1	0.1	1.8	0.6	0.2	0.8	2.2	1.7	22.3	3.1
STREAKER	166.2	1.5	0.0	0.0	0.0	0.1	0.0	1.8	0.1	0.0	17.0
ROCK COD	44.2	8.6	8.0	4.7	9.9	4.6	4.0	3.2	5.7	4.9	9.8
CAT FISH	8.3	2.1	0.1	0.0	0.1	0.0	0.0	0.2	0.2	0.0	1.1
MIXED DEM.	236.2	123.0	109.5	92.9	966.1	56.0	42.1	49.8	67.8	88.3	183.2
UNACC.FOR	175.5	52.1	40.9	36.2	46.3	33.9	25.9	33.6	33.8	38.9	51.7

CAVALLA JACKS	113.7	53.8	5.1	5.2	12.6	13.8	3.3	4.2	6.7	3.5	22.2
MULLETS	54.2	22.4	19.7	20.4	21.1	23.1	15.9	16.9	18.8	20.8	23.3
LITTLE MACK.	55.1	30.1	18.4	30.8	15.4	22.4	18.1	26.6	21.0	15.7	25.4
BARRACUDA	47.2	9.9	6.9	8.4	11.2	3.3	3.6	4.1	11.8	12.9	11.9
MILK FISH	7.5	1.1	0.3	0.1	0.0	0.0	0.0	0.9	0.1	0.0	1.0
KING FISH	27.0	5.2	4.2	2.7	14.2	15.4	12.7	12.9	15.2	9.9	11.9
QUEEN FISH	13.5	2.5	0.9	0.5	11.5	12.8	8.0	10.6	11.6	9.6	8.2
SAIL FISH	4.0	1.0	0.7	0.7	0.5	0.5	0.5	0.4	1.2	3.7	1.3
TUNNY	1.7	1.3	0.6	0.1	0.2	0.0	0.0	0.1	0.5	0.5	0.5
DOLPHIN	1.3	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
MIXED PEL.	79.3	6.7	0.3	2.1	8.1	31.9	20.1	4.2	2.7	7.0	16.2
UNACC.FOR	60.7	20.3	8.6	10.7	14.3	18.5	12.3	12.1	13.4	12.6	18.4

SHARKS/RAYS	129.2	22.2	18.1	18.2	18.5	18.2	13.8	14.3	18.5	13.5	28.5
SARDINES	223.5	91.5	59.7	73.3	47.3	63.4	58.0	28.8	22.4	28.8	69.7
MIXED/OTHERS	740.1	1862.5	274.4	330.2	639.5	920.9	778.2	1360.9	430.7	287.5	762.5
UNACC. FOR	166.7	296.4	8.6	63.2	105.8	150.4	127.5	210.6	70.7	49.5	124.9

LOBSTERS	7.0	2.2	1.7	6.9	72.4	124.3	83.8	0.6	2.7	1.5	30.3
PRAWNS	482.6	33.9	150.4	345.5	172.8	3337.1	414.6	715.5	527.0	397.2	657.7

CRABS	214.5	5.7	7.1	8.9	9.4	8.1	4.6	12.0	19.0	14.3	30.4
UNACC.FOR	76.6	52.0	23.9	54.2	38.2	70.4	75.4	109.2	82.6	61.9	64.4
OYSTERS	7.6	8.1	2.5	3.0	1.5	0.0	1.8	0.0	0.0	0.0	2.5
BECHE-DE-MER	67.1	217.6	0.6	19.5	26.4	0.0	12.8	0.0	0.0	0.0	34.4
OCTOPUS	54.3	14.2	12.6	14.1	370.2	9.2	250.6	17.8	20.7	17.7	78.1
SQUIDS	28.2	7.2	6.3	19.2	317.4	363.1	291.8	2.7	8.1	7.0	105.1
GAME FISH	52.2	0.0	0.0	328.4	372.5	55.8	83.5	0.0	0.0	0.0	89.2
TOTAL	4449.3	3167.6	944.9	1644.2	3526.2	5522.5	2489.5	2823.4	1564.0	1293.0	2742.4

Table 6: Kwale District Marine fisheries catch in MT from 1991 to 2000

MARINE FISH/Year	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Average**
RABBIT FISH	87.3	76.7	52.3	48.7	59.6	82.3	85.4	75.6	86.4	71.4	72.6
SCAVANGERS	87.1	89.0	57.7	73.9	69.5	112.6	100.2	90.8	117.6	93.8	89.2
SNAPPERS	60.8	46.9	33.3	37.3	36.1	46.9	56.0	15.0	54.1	52.7	43.9
PARROT FISH	82.7	60.2	49.8	52.4	53.0	66.5	82.9	46.5	54.6	53.3	60.2
SURGEON FISH	13.8	10.0	8.7	8.8	9.3	9.5	9.4	12.4	7.7	16.0	10.6
URNICORN FISH	7.9	7.5	7.0	6.3	8.5	9.2	6.9	11.3	7.9	10.4	8.3
GRUNTER	7.7	9.7	6.7	11.7	9.0	11.6	25.2	18.1	29.2	17.6	14.7
POUTER	34.8	36.6	28.5	32.4	32.7	41.5	51.4	45.9	44.8	45.4	39.4
BLACK SKIN	46.7	22.3	17.2	22.3	17.4	18.4	24.1	22.6	28.0	29.8	24.9
GOAT FISH	21.0	16.9	14.2	21.3	18.3	16.8	18.7	11.6	22.9	23.2	18.5
STREAKER	6.8	4.7	6.0	10.3	10.9	10.3	12.0	29.8	27.6	21.9	14.0
ROCK COD	23.7	19.2	15.7	16.8	23.4	25.6	21.3	29.3	29.7	36.4	24.1
CAT FISH	11.1	9.0	8.8	6.7	8.8	11.2	15.2	12.9	13.2	13.8	11.1
MIXED DEM.	46.7	47.9	44.6	43.9	46.8	51.4	69.2	51.9	84.1	92.3	57.9
UNACC.FOR	82.4	68.5	52.7	59.0	60.5	77.1	55.7	75.6	91.3	86.7	71.0
CAVALLA JACKS	22.6	25.9	19.0	29.8	20.8	33.6	77.2	49.9	51.9	37.4	36.8
MULLETS	23.6	17.9	16.8	18.3	20.5	36.2	38.6	29.8	44.6	33.4	28.0

LITTLE MACK.	36.9	29.2	19.3	34.0	41.8	39.3	43.4	82.1	66.3	67.9	46.0
BARRACUDA	15.4	14.1	12.9	16.6	19.8	25.1	24.9	39.7	62.1	50.2	28.1
MILK FISH	8.8	4.5	5.2	4.8	9.7	10.1	9.0	15.3	11.1	16.4	9.5
KING FISH	10.8	6.7	5.9	7.7	9.3	19.6	22.9	28.0	25.4	21.5	15.8
QUEEN FISH	11.0	6.6	8.0	6.3	15.1	12.4	15.9	24.4	20.8	17.7	13.8
SAIL FISH	6.3	4.7	5.6	14.0	11.5	15.7	7.9	6.7	13.9	21.3	10.8
TUNNY	13.1	8.1	7.3	11.5	11.4	21.0	48.9	27.6	38.0	30.2	21.7
DOLPHIN	2.0	6.4	3.9	3.0	7.8	7.9	7.3	5.4	5.3	6.1	5.5
MIXED PEL.	39.7	53.4	31.7	37.0	54.3	66.8	77.0	60.2	57.0	71.7	54.9
UNACC.FOR	28.6	26.7	20.4	27.5	34.5	43.2	56.1	55.4	59.5	56.1	40.8
											0.0
SHARKS/RAYS	32.2	48.9	42.1	40.8	44.8	70.1	52.2	56.4	45.5	37.8	47.1
SARDINES	48.5	238.8	46.6	36.2	32.6	67.8	82.5	83.3	73.5	65.4	77.5
MIXED/OTHERS	15.1	13.1	11.0	15.1	14.6	11.3	24.6	10.4	13.0	12.5	14.1
UNACC. FOR	14.3	45.1	20.4	13.8	13.8	22.4	23.9	22.5	19.8	17.4	21.3
											0.0
LOBSTERS	5.6	4.2	4.5	4.3	11.9	12.4	17.3	14.8	18.5	16.9	11.0
PRAWNS	5.1	3.7	4.1	2.9	4.9	9.6	21.9	20.4	11.3	15.6	10.0
CRABS	7.4	3.2	7.8	7.2	26.6	50.6	44.5	48.9	54.3	42.8	29.3
UNACC.FOR	2.7	1.6	2.4	2.1	6.5	10.8	12.6	12.6	12.6	11.3	7.5
OYSTERS	0.0	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
BECHE-DE-MER	6.3	4.8	11.0	17.6	14.9	10.6	20.6	5.9	11.0	19.3	12.2
OCTOPUS	46.6	19.6	48.3	70.3	60.8	88.5	122.3	79.7	103.4	78.0	71.8
SQUIDS	19.6	38.6	18.0	26.6	22.2	21.3	22.4	25.1	24.3	32.6	25.1
GAME FISH	0.0	0.0	0.0	0.0	0.0	18.0	24.8	16.6	20.8	19.5	10.0
TOTAL	1042.7	1151.0	775.8	899.2	973.9	1315.2	1532.3	1370.4	1563.0	1463.7	1208.7

Table 7: Percentage of catch per marine product type per Disctritct (demersal, pelagics, crustaceans, others) on the basis of statistics above.

Catch/Districts	Lamu	Tana	Malindi	Kilifi	Mombasa	Kwale	Total
Catch MT							
Demersal	885.9	62.3	70.2	99.5	524.3	560.2	2202.3
Pelagic	120.9	3.9	81.3	94.7	140.5	311.6	753.0
Sharks/rays	33.3	9.7	18.0	56.3	985.6	160.0	1262.9
Crustacea	90.0	6.8	22.9	5.5	782.8	57.8	965.7
Other	3.8	0.0	4.2	28.1	309.3	119.0	464.5
Percentage Catch							
Demersal	40.2	2.8	3.2	4.5	23.8	25.4	100.0
Pelagic	16.1	0.5	10.8	12.6	18.7	41.4	100.0
Sharks/rays	2.6	0.8	1.4	4.5	78.0	12.7	100.0
Crustacea	9.3	0.7	2.4	0.6	81.1	6.0	100.0
Other	20.1	1.5	3.5	5.0	48.6	21.4	100.0

APPENDIX 6: FIELD RESEARCH SITES SELECTION PROCESS

0. Selection criteria

One of the objectives of the review was to select representative sites where in depth field research would be carried out (a livelihood appraisal and census workshops). These sites had to be chosen on the basis of the knowledge gathered through the review process.

The sites to be selected had to be representative and correspond to criteria defined by the research teams at the beginning of the project.

Six criteria were taken into consideration:

7. Poverty: selected communities had to be poor as the project aims at targeting the poor
8. Biophysical environment (2a) and fishing use patterns (2b), including dependence on fisheries resources: these needed to be representative of the Kenyan coast and fishery.
9. Demography: communities had to be of manageable and representative size. Urban centres were eliminated as they are often too large and too complex for a short study. Dependence on fishing in urban centres is also likely to be much lower than in rural coastal areas.
10. Accessibility: communities had to be relatively accessible. This relates to logistics of field research and of the census workshop (activity 4). Cost and availability of transport to the site, and from the villages to the workshop venue.
11. Information/on going and previous research projects: general information had to be available for the area but no previous extensive studies or on-going fisheries studies should have been undertaken or be underway in the selected communities. The main reason for this was to make sure that this project contributes to producing new knowledge. Furthermore, field research is often difficult if numerous studies have been carried as this often results in informant fatigue.
12. No Marine Protected Area: selected communities should not be adjacent to a Marine Protected Area. In Kenya the presence of MPAs can create community resentment towards any form of research or management authority. Fisheries around MPAs are also not representative of the majority of the coast as they are subject to different rules.

A first round of selection was carried out to identify least representative areas (the District, location and sub-location level when possible). For each criteria, most unsuitable areas were identified and given a score of 0, others were given a score of 1. Four criteria were considered eliminatory for an area:

- Inaccessibility
- The sites is an urban centre
- The presence of an MPA

Another factor which was eliminatory for an area was the presence of conflicts on resource use which would be an impediment for socio-economic work to be carried out (see section 7 below).

For each area a total score was calculated. Sub-locations with the highest score were selected.

A second round was carried out in the selected sub-locations so that specific communities could be selected and a reconnaissance field visit was undertaken to finalise the selection.

1. Selection on the basis of the poverty criteria

The aim of the project was to target the Poor, it was thus important to select an area where people are poor. As detailed in the review (part 3), the Coast province is one of the poorest in the country.

Table 1 below ranks the Coastal Districts according to poverty (4 corresponds to the higher poverty level).

Table 1: Rural poverty (Adult equivalent) in rural Districts* of the Coast Province (%)

District	Food Poverty		Overall poverty		absolute poverty		Hard Core poverty	
	%	Rank	%	Rank	%	Rank	%	Rank
Kilifi	**63.68**	**4**	**66.3**	**4**	**66**	**4**	**48.98**	**4**
Kwale	58.94	3	60.5	3	61	3	44.8	3
Lamu	31.86	2	39.35	2	39	2	18.44	2
Taita/Taveta	62.44		65.82		66		47.25	
Tana River	31.23	1	34.22	1	34	1	12.77	1
Coast	*59.46*		*62.1*				*44.78*	
Kenya	*50.65*		*52.93*				*34.82*	

Adapted from GK, 2000

* Although Taita Taveta is part of the Coastal Province it is not bordering the sea, and is thus not taken into consideration in the selection process. Malindi and Mombasa are considered urban in the survey.

Kilifi is one of the poorer sea bordering Coastal Districts closely followed by the Kwale District. 63.7% (Kilifi) and 58.9% (Kwale) (adult equivalent) live under the food poverty line, a higher % than the national average of 50.6% for both Districts and a higher % than the Coast Province average of 59.5% for the Kilifi District. In terms of overall rural poverty, Kilifi scores first of the sea bordering Districts with 66.3% of adult equivalent rural poor (average Province: 62.1%) again followed by the Kwale District (60.5%). Furthermore a study showed that there was a high percentage of stunted children in Kilifi District compared to other areas in Kenya (Hoorweg et al., 1994).

It was estimated that the level of information was insufficient to assign a rank to sub-locations on the basis of the poverty information at the District level. Thus the ranking of the District according to poverty was not taken into consideration in the overall scoring of the areas. However, it was decided that should two sub-locations score equally, the District poverty rank would determine the selection.

2. Most suitable areas on the basis of biophysical and use pattern representativity

2.1 Biophysical criteria

The 600 Km or so of Kenya coast were divided into two main zones and five sub zones on the basis of biophysical characteristics (see table 2.1 in the review). Estimates of the proportion of the coastline these represent are presented in the table below.

Table 2: Coastal biophysical zones and representativity

Areas/ District	Type of Habitats	Proportion of the Coast (%)	Score

Tanzania border-Malindi			
Gazi Bay-Vanga-Shimoni	Complex of mangrove bays, estuaries and creeks close to shore in proximity to patch and island reefs.	10%	0
Diani-Watamu Fringing Reef	200km fringing reef with shallow lagoon with narrow channels connecting it with the open ocean.	30%	1
Malindi-Watamu	Fringing reef with deep offshore banks close to continental shelf. Mida Creek.	5 %	0
Malindi-Somali border			
Ngomeni-Ungwana Bay	Tana, Kenya's largest delta with extensive channels, floodplains, coastal lakes, mangroves and wetland areas and the Sabaki River mouth.	20%	1
Lamu archipelago	System of barrier islands, patch reefs, lagoon, creeks, inlets and basins.	35%	1

The Diani-Watamu , Lamu archipelago and the Ngomeni-Ungwana Bay complexes make up most of the Kenyan coastline (very roughly 85%). The two other areas represent less than 20% of the coastline. The least representative areas of the Kenya coast would thus be the Malindi-Watamu and the Gazi-Bay Vanga stretch (these were given a score of 0) all other areas were given a score of 1 as they represent a similar proportion of the coast.

2.2. Fishing use patterns

Use patterns reflect information on fishing methods, fishing vessels, species targeted, fishing location, numbers of stakeholders and dependence on fishing.

Most of marine fisheries in Kenya are small scale artisanal fisheries. Fishers used mainly non motorised boats (dug out canoes, outriggers canoes and dhows). Motorised boats are scarcely used. A small number of trawlers are used in Ungwana Bay (UNEP, 1998).

The most widely used gears are beach seines, handlines, traditional gill nets and basket traps, see section 2.3.3 of the review). Medium scale, commercial fishing is carried out in Ungwana Bay using bottom trawls.

In most of the areas fishers stay inshore part of the year and venture off shore during the calmer North East monsoon. Lagoon areas are the most exploited. Creeks are also used (see section 2.3.3. of the review).

The catch is mainly composed of sea grass and reef associated demersal fish as well as some pelagic species (ribbon fish, sardines) found in the lagoons during the calmer season. Kingfish, sharks, jacks are also caught, usually during the calmer season when boats can venture beyond the sheltered lagoons and creeks. Lobster are found in Lamu mainly. Prawns are caught in Ungwana Bay and on a very small scale in other estuaries, particularly in Shimoni sub-location (see section 2.3.3.).

The review identified information gaps on catch levels and dependence on fisheries resources. Available information was not sufficient to use in the selection process (see section 2.4.1 of the review).

Least representative areas in terms of use patterns were identified on the basis of the information gathered through interviews (see the typology established, section 2.3.3). These areas were given a score of 0 and all others a score of 1.

Artisanal fishing use patterns were found to be relatively homogeneous along the coast. However, the Lamu fishery is the richest fishery on the Coast and benefits from upwelling waters from Somalia which is particular to Lamu. Similarly the Ngomeni-Ungwana Bay area (including the Tana River area) extending to the Sabaki area is high in nutrients and supports larger prawn and lobster fisheries. Ngomeni/Ungwana Bay is, like the Lamu area, unusual. The nutrient rich waters support a medium scale prawn trawling fishery which is particular to this area and not representative of the majority of the coast. The presence of these two fisheries triggers conflicts and complexities which again are not representative of the coast as a whole (e.g: sale of by catch by commercial fishery to small scale fishers, destruction of small scale gear by trawlers etc.). Healthier and richer fisheries in these two main areas may also mean that fishers are wealthier than in other areas along the coast.

Thus areas identified as least representative on the basis of use patterns were the following:

- Lamu District
- Tana River District
- Malindi: Fundisa, Gongoni, Ngomeni, Mambrui, Sabaki.locations.

3. Demography

Urban centres were not to be selected as research sites because of their complexity. Size needed to be representative as well as manageable. The larger the community the less manageable for a short duration study such as this. Sub-locations were divided in categories (from very small to very large on the basis of population size, see appendix 7).

Demographic information was available at sub-location level. Urban centres were eliminated. A wide variety of activities are carried out in urban centres and dependence on fishing is likely much higher in rural areas. Furthermore, in very populated areas, community boundaries are often difficult to identify and these are less representative of the coastal communities which are predominantly rural.

Areas eliminated on the basis that they were urban were:

- Diani/Ukunda
- Kilifi: Kilifi Town,
- Malindi (Shella)
- Lamu Town.
- Mombasa

Areas with populations ranked as very large and large were considered less suitable due to lesser capacity to study them in this short project. Areas where population was identified as very large were all urban centers (see Appendix 7).

Areas considered as least suitable (score of 0) on the basis of size of population were:

- Malindi District: Gongoni and Sabaki sub-locations
- Kwale Disctrict: Kinondo and Vingujini sub-locations.

4. Accessibility

For project logistic and financial reasons accessibility of the sites was an important criteria.

Tana River and Lamu Districts were considered inaccessible due to security issues for road transport, travelling time by road and the cost of air transport to Lamu. Other areas are relatively accessible from Mombasa by road but travelling time varied.

Areas eliminated on the basis of inaccessibility were:

- Tana River District
- Lamu District

It was also considered that areas beyond 2-3 hours travelling time from Mombasa were least suitable for the field research. Areas least suitable (score 0) on the basis of travelling time:

- Kwale Disctrict: Vanga and Kiwegu sub-locations.

5. Research and on going projects

It was important that the project widens the knowledge base on the understanding of fisheries dependent livelihoods on the coast of Kenya. Furthermore, an overload of socio-economic research also creates research fatigue in the communities. If not followed by action, research often results in communities' unwillingness to participate in any further research.

There are a number of on-going projects on the coast. An overview of socio-economic research was put together in early 2001 and updated during the review process (see appendix 8). Areas where research and/or or projects are being carried out or have been carried out were considered least suitable for the field studies and were given a score 0, other areas were given a score of 1.

The least suitable areas for field research on the basis of unsuitable sites on the basis of known on-going / previous projects were:

- Lamu District: Kiunga (WWF project)
- Tana River District: Ungwana Bay (fisheries Department research and future project supported by WIOMSA)
- Malindi District: Watamu/Malindi (Watamu Turtle Watch does socio-eoconomic research)
- Kilifi District: Takaungu, Uyumbo, Mida Creek
- Mombasa District: Bamburi- Shanzu area-Coastal management Project, Mombasa/Tsunza: Crab project
- Kwale District: Kitivo sub-location (EC project), Diani, Kinondo locations- CORDIO project and ICAM/IUCN project, Gazi sub-location- Mangrove rehabilitation and oyster culture projects (KMFRI).

6. MPA

The presence of an MPA will bias the research and has created animosity in some areas, particularly on the South Coast (see next section). The MPA situation is not representative of the Coast as a whole.

There are five marine parks and reserves in Kenya (see maps 1 to 7). Sub-locations adjacent to MPA were eliminated (other sub-locations were given a score of 1). These were:

- Lamu District: Mkokoni, Kiwaiyu, Rubu/Mwandore sub-locations,
- Malindi Disctrict: Shella, Watamu, Darkasi, Jimba, Dabaso, Mida sub-locations
- Kilifi District: Mtwapa- Shimo la Tewa, Uyombo sub-locations

- Mombasa District: Bamburi sub-location
- Kwale Disctrict: Diani, Kinondo, Shimoni and Wasini/Mkwiro locations and sub-locations.

7. Other reasons for site unsuitability

The conflict situation between the Kenya Wildlife Service and communities and the resentment communities have cultivated in relation to the gazettment of the Diani Marine Reserve makes socio-economic work for new projects very difficult in the Tiwi, Diani and Kinondo areas. Fishermen resent any researcher and are suspicious of any new comer whom they associate directly with Marine Parks. This situation arose about 7 years ago (see Malleret-King, 1996; Rubens, 1996; King, 2000) and still carries on (Wanyonyi *pers. comm*.). These areas were eliminated from the process.

Areas eliminated on the basis of conflicts with regards to resource use:

- Kwale Disctricts: Tiwi, Diani, Kinondo locations

8. Summary of the first round of selection

When scores could only be given at a District level or at a location level depending on the information available, similar scores were given at the lower levels.

Table 3: Sub-locations scores (Eliminated areas are marked with a cross (x))

Districts	Sub-locations	1	2a.	2b	3.	4.	5	6	Other	Score"
Lamu	Lamu town	3	1	0	X	X	1	X	1	X
	Mkononi/Kiunga	3	1	0	-	X	0	X	1	X
	Kwaiyu	3	1	0	-	X	1	X	1	X
	Rubu	3	1	0	-	X	1	X	1	X
Tana River	Kipini	2	1	0	1	X	0	1	1	X
Malindi	Fundisa	-	1	0	1	1	1	1	1	6
	Gongoni	-	1	0	0	1	1	1	1	5
	Ngomeni	-	1	0	1	1	1	1	1	6
	Mambrui	-	0	0	1	1	1	1	1	5
	Sabaki	-	0	0	0	1	1	1	1	4
	Shella	-	0	1	X	1	0	X	1	X
	Watamu	-	1	1	1	1	0	X	1	X
	Darkasi	-	1	1	-	1	-	X	1	X
	Jimba	-	1	1	-	1	-	X	1	X
	Dabaso	-	1	1	1	1	1	X	1	X
	Mida	-	1	1	1	1	1	X	1	X
Kilifi	Uyombo	5	1	1	1	1	0	X	1	X
	Mtondia/Majaoni	5	1	1	1	1	1	1	1	7
	Mdangarani	5	1	1	1	1	1	1	1	7
	Kilifi Township	5	1	1	X	1	1	1	1	X
	Takaungu	5	1	1	1	1	0	1	1	6
	Shimo la Tewa	5	1	1	X	1	1	1	1	X
Mombasa	Bamburi	-	1	1	X	1	0	X	1	X
	Likoni	-	1	1	X	1	1	1	1	X
	Mikindani	-	1	1	X	1	1	1	1	X
	Mishomoroni	-	1	1	X	1	1	1	1	X
	Port Reitz	-	1	1	X	1	-	1	1	X
	Island	-	1	1	X	1	1	1	1	X
Kwale	Tiwi	4	1	1	1	1	1	1	X	X
	Kitivo	4	1	1	1	1	0	1	X	X
	Ukunda	4	1	1	X	1	0	X	X	X
	Kinondo	4	1	1	0	1	0	X	X	X
	Gazi	4	0	1	1	1	0	X	1	X
	Vingunjini	4	0	1	0	1	1	1	1	5
	Milalani	4	0	1	1	1	1	1	1	6
	Shimoni	4	0	1	1	1	0	X	1	X
	Wasini-Mkwiro	4	0	1	1	1	0	X	1	X
	Vanga	4	0	1	1	0	1	1	1	5
	Kiwegu	4	0	1	1	0	1	1	1	5

* The total score of each location was calculated taking into consideration the poverty ranks.
** When information was available at the District or location level only, the sub-location were given the same score as the relevant District or Location.

According to the ranking process carried out, two areas are identified as most suitable for the fieldwork research: Mtondia/Majaoni, Mdangarani.

9. Selection of communities

The second step of the site selection for field research was to identify communities from the two areas emerging as most suitable for the fieldwork research.

Table 4: Potential sites for research

District	Sub-location	Number of households	Size	Number of fishers
Kilifi	Mtondia/ Majaoni	1,542	M	450
	Mdangarani	118	VS	70

From discussions with the Fisheries Department and Mr. Tunje (from Kilifi, and socio-economist for this project), five main fishing communities were identified Roka, Mtondia, Chumani (Mtondia/Majaoni), Kidundu and Maya (Mdangarani).

It was first decided that Kidundu and Maya were too difficult to access (more than 1h boat ride) to be considered as potential sites. Thus a reconnaissance trip was done to identify which of Roka, Chumani and Mtondia were the most suitable communities.

It was found that Roka was difficult to access for the researcher (about 1 hours 15mins walk from the main road and 1/2 and hour drive on tarmac from Kilifi, note that the researcher was not in a condition to walk long distances at the time of the field work). Furthermore, from discussion with villagers it was discovered that the main fishing gear was spear guns and that fishers were relatively few. After discussion with people from Roka village it was also discovered that permanent fishers at Roka were predominantly spear gun fishers and were very few.

After the first days of research, and after dependence on fishing was investigated further, it appeared that Mtondia might not be as dependent on fishing as first thought. A reconnaissance trip was therefore undertaken to Kidundu (the nearest of the two Creek villages) to see whether it would be feasible to include it as a site. When visited it was found that it was the more dependent on fishing and seemed poorer than the two other communities. It was thus included as a field research site.

Selected communities' characteristics are described in tables 5 and 6. These characteristics were identified through the reconnaissance trips (discussion with fishers and Village chairmen) and the discussion with the Fisheries Officer in charge.

Table 5 : General and socio-economic characteristics of selected villages

Village/area	**Size**	**Accessibility**	**Fisheries Information/projects**	**Activity ranking according to number of people involved.**	**Poverty** (level to be confirmed)
Mtondia	Medium	Very high	Little (information gathered through an IUCN workshop for coastal management in 2002, Oyugi form IUCN, *pers. comm*)	1. Fishing/Quarrying, 3. Small business (including fish traders)	Poorer: Fishers and quarry workers
Chumani	Small	High	None	1. Fishing/	Poorer:

				Farming, 3. Quarrying/small business	Fishers
Kidundu	Small	Medium	Biological research in the Creek	1. Fishing/Fish trading 2. Farming 3. Wood collecting	Poorer: fishers

Table 6: Fishing patterns of the selected communities

Village/area	Gear used	Vessel	Fishing location	Biophysical	Number of fishers
Mtondia	Seine nets, traps, hand lines, set nets, spear guns	A few dug out canoes	In and out of the lagoon depending on the season and gear	Fringing reef	100
Chumani	traps, hand lines, set nets, spear guns	Dug out canoes	In and out of the lagoon depending on the gear and the season	Fringing reef	100
Kidundu	Traps, hand lines, cast nets, tidal weirs	Dug out canoes	Kilifi Creek, in lagoon	Creek	80

The three communities are representative of the Kenyan Coast small scale artisanal fishing, there is little information and on-going fisheries/socio-economic projects in these communities, they are relatively accessible and represent a significant size population.

10. Note on the limits of selection process

The selection process was carried out on the basis of the review findings. However some parameters such as demographics, poverty and dependence (included in fishing patterns) cannot be determined for the local level without further research. However it was possible, by observing, to get an idea of poverty and size.

10.1. Poverty

In the review, Kilifi Disctrict was found to be the poorest of the rural coastal Districts, however, no information was available at lower levels.

From discussion with fishermen and village elders, it came out that fishermen in the three communities were relatively poor. Relative poverty is difficult to appreciate in a reconnaissance trip. However going through Chumani for example, few stone houses were noticed or corrugated iron roofs were noticed, hardly any in Kidundu. People lived in mud houses with thatched roofs, gardens/cultivation did not seem well tended. Quite a few badly maintained houses were noted as well. From other studies (Malleret-King, 2000) it appears that if households manage to get a surplus they invest in the housing material. The two communities appeared poor.

In Mtondia, a number of cemented houses were noted. Discussions with the village chairman suggested that these houses mostly belonged to non fishers (business men mainly). They were located around the centre of the village. Further away from the centre mud houses and thatched roofs predominated. No corrugated iron roofs were noted.

From the reconnaissance trip and discussions with Mr. Tunje, it appeared that Kidundu might be the poorest of the three villages.

Most fishing villages are poor in the area, the poorest being Uyombo. Uyombo village is one of the poorest in the area (Fisheries Department, pers. comm., Joseph Tunje, pers comm.). Uyombo was not considered as an option however as it borders a MPA, and has been extensively studied. Maya and Kidundu were also considered as particularly poor.

10.2 Demographics

There is no available information at the Communities/ villages level. During the review communities were ranked into small, medium and large categories in reference to communities which were known by the researchers. This is a very rough estimation of the size of the fishing villages/communities and cannot be considered as precise. However it provides an indication on the perceived size of the community/Villages.

Mtondia has a centre and a market, during the reconnaissance it was estimated that it represented more than 100 households thus was considered as a medium sized village.
Chumani is composed of 7 areas but has a village elder at the Chumani community level as well as village elders for each of the sub-communities or boroughs. Chumani can thus be considered as one community. Chumani is much smaller than Mtondia and thus is considered small. When visited, Kidundu was also ranked as small, and appeared smaller than Chumani when visited.

10.3 Information gaps

Information was lacking from the Lamu District. However this did not affect the selection process as Lamu was eliminated on the basis of its inaccessibility.

APPENDIX 7. RANKING SUB-LOCATIONS ACCORDING TO DEMOGRAPHIC INFORMATION

Table 1: Demographic information at the sub-location level (urban centres are marked in bold)

District	Location	Sub-location	Number of households	Relative Size (*)	Number of registered fishers
Lamu					
Tana	Tana River	Kipini	714	VS	400 (290 registered)
Malindi	Fundisa	Fundisa	1,021	S	500
	Gongoni	Gongoni	1,871	L	625
		Ngomeni	826	S	
	Magarini	Mambrui	1,703	M	
	Malindi	Sabaki	1,900	L	203
		Shella	**7,501**	**VL**	
	Watamu	Watamu/Darkasi/Jimba	1,430	M	235
	Gede	Dabaso	1,601	M	
		Mida	665	VS	
Kilifi	Matsangoni	Uyombo	585	VS	100
	Tezo	Mtondia/ Majaoni	1,542	M	450
	Kauma	Mdangarani	118	VS	70
	Kilifi Township	**Sokoni**	**1798**	M	70
	Kilifi Township	**Mnarani**	**1642**	M	50
	Takaungu/ Mavueni	Takaungu	949	S	400
	Mtwapa	**Shimo la Tewa**	**7,905**	**VL**	**120**
Mombasa		**Bamburi**	**2,569**	**L**	**140**
		Likoni	**19,933**	**VL**	**150**
		Mikindani	**9,637**	**VL**	**220**
		Mishomoroni	**14,599**	**VL**	**35**
		Port Reitz	**16,765**	**VL**	**48**
		Island (Old Port)	**3,600**	**L**	**30**
Kwale	Tiwi	Simkumbe	1804	M	25
	Waa	Kitivo	931	S	50
	Diani	**Ukunda**	**6,869**	**VL**	**100**
	Kinondo	Kinondo	2,489	L	150
		Gazi	809	S	60
	Msambweni	Vingujini	2,053	L	300
		Milalani	815	S	
	Pongwe & Kidimu	Shimoni	563	VS	400
		Wasini-Mkwiro	208	VS	
	Vanga	Vanga	684	VS	300
		Kiwegu	732	S	

Note*: The sub-locations were divided into 5 categories according to 20% percentiles leading to the following scale. No information was obtained from Lamu.

Table 2: Scale established on the basis of available information (excluding Lamu)

Nber households	0-724	725-1102	1103-1812	1803-4907	> 4907
Relative size	Very small	small	Medium	large	Very Large

APPENDIX 8: INFORMAITION ON PROJECTS AND RESEARCH ON THE COAST OF KENYA

Table: On going, past and future marine and fisheries related work on the coast (this was a draft table put together in the context of a coast socio-economists meeting, February 2001- unpublished, not complete but provides an overview of research on the coast)

Site	N	Author/date/Key words for report or project	Type	Organisation
Kiungaà Ndau	1	- (Gubelman and Kavu. 1996.) Traditional uses. Kiunga and Dodori. PRA.	Baseline study	KWS/WWF
	2	- Tunje. 2000. Fisheries practices and awareness.	MSc	Moi Univ.
	3	- Kairo, Mwaina. 2001. Mangrove assessment Kiunga area	Report	KMFRI/WWF
	4	- Start 1999. Indigenous fisheries info, monitoring.	Project on going	WWF
	5	- Start 1998. Fish monitoring.	Project on-going	WWF/CORDIO
Malindi-Kilifi	6	- Tunje. Diversitfication activities. (Malindi-Watamu)	Proposal	
	8	- Wamukota. Start 2001. Fish marketing and fuel woods	MSc. on-going	Moi University
	9	- Fulanda. 1998. Fisheries and prawn Trawling (Ungwana Bay)	Report	D.o.F./CERS
	10	- Start ?. Impact of prawn trawling (Ungwana) - Ungwana Bay: socio-econonomic assessment to be started	Project suspended Research	KMFRI?? WIOMSA/Fisheries Department
	11	- Westerink. 1996. Tourism, local attitudes and participation	MA	Wegeningen
	12	- History of Malindi?	Book?	?
	13	- Socioeconomic study Forest (Arabuko)??)	?	?
	14	- Masad Omar. Catch composition-reproduction	Msc on-going	Moi Uni./CERS
	15	- 1997. Socioeconomic assessment (Mida)	Baseline	KWS/KMFRI
	16	- 2000. Technical report (Mida)	Project	EU/KMFRI
	17	Ref. 2 (Tunje.2000)	MSc	Moi Uni.
	18	Turtle Watch programme?	Project on-going	
	19	- Socio-economic assessment Malindi-Watamu MNP	Proposal	KWS/Wetlands
	20	- Nicole 1999? . Socioeco. Work, history, household (Takaungu/Uyombo)	MSc	Wageningen
	21	- Kennedy. 1991. Coastal management. MPA. (Mida)	Paper	Ocean and Shoreline management 14, 105-132
Mombasa	23	- Glaesel. 1997. Socioeconomics, MPAs, Fishers	PhD	Wisconsin Uni
	24	- Rodwell. MPA....	PhD, on-going	York Uni
	25	- McClanahan. 1997. MNP recovery, CPUE	Paper	CRCP
	26	- Fish Catch monitoring	On-going	CRCP/CARH?? ?

	27	- 1996. Nyali-Bamburi-Shanzu Management plan	Report?	CDA
	28	- Ngugi. 2000. Tourism and bleaching.	Report	CORDIO
	29	- Ngugi. 1999. Tourism/MPA benefits	MSc	Nairobi Uni.
	30	- ?. Fisheries and bleaching. Socioeconomic impacts	Study	KMFRI/CORDIO
	31	- ? ?. Mangrove and fisheries (Port, Ndoa Creek?)	Project?	Esherton Uni?/KMM
	32	Kim Oosteveen. Economic attractiveness Vs environmental problems of Msa Port	Ph.D	University of Arsterdam
	33	- Start?. Crab project (Tsunza). Plans for SEA	Project on-going	??
Tiwi- Diani-Chale	34	- Start 2000. Coral rehabilitation. Fisheries, tourism	Project on-going	EU/KMFRI/ACC
	35	- Rubens. 1996. Cost/Benefit analysis of reserve (Diani).	MSc	Newcastle Uni
	36	- See ref. 23	PhD	
	37	- 2000. Socioeconomic Assessment	Baseline	CDA/IUCN/ICAM
	38	- Start 1999?. Conservation, partnership (Diani Chale)	Project on-going	IUCN/ICAM
	39	- King. 2000. Livelihoods and governance. Fisheries (Galu)	PhD	Warwick Uni
	40	- Malleret-King. 1996. Livelihoods (Galu)	MSc	Sorbonne
	41	- Ngw'eno. 1995. Land inheritance.Digo	MA	Stanford
	42	- Start 1995?. Fish catch monitoring	Project on-going?	CRCP/CARH?
	43	- Ochiewo. 2001. Analysis of resource use conflicts at Diani.	Report	KMFRI/KWS/IUCN
	44	- Start 1997. Monitoring, mapping, participation	Project on-going	CORDIO
Gazi-Shirazi-	45	- ??. Mangrove rehabilitation	Project ??	??
	46	- Oyster (Shirazi)	Project ??	KMFRI/KBP?
Shimoni Vanga	47	- Emerton and Tessema.(1999) Economics, Kisite Mpunguti - Partnership	Working Paper	IUCN-EARO
	48	- Malleret-King. 2000. Socioeconomic impacts of MPA, food security	PhD	Warwick Uni
	49	- Start? Catch monitoring, participation (Mkwiro)	Project on-going	Fisheries/KMFRI?
	50	- Start 1998??. Coral garden board walk	Project on-going	IUCN/KWS?
	51	- Start1999? Seaweed farming	Project on-going	IUCN/KWS?
	52	- Watson. 1996. Impacts of MPA on fishery (Kisite)	PhD	York