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SOCIAL, ECONOMIC AND ENVIRONMENTAL IMPACTS OF BEACH SEINING IN KENYA

- AN INFORMATION REVIEW AND FIELD STUDY-

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Final Report

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I Foreword

This discussion paper presents the result of a national study on the social economic and environmental impacts of beach seining in Kenya commissioned by the Sub Regional Office for Eastern Africa of the Food and Agriculture Organization of United Nation (FAO), and implemented by Coastal Oceans Research and Development in Indian Ocean - East Africa (CORDIO EA) in 2007-2008.

The overall objective of the study was to provide an analysis of the status of beach seining in Kenya based on the results from a field survey, both at the Coast and at Lake Victoria, and a literature review, and to deliver a series of recommendations for decision makers.

In line with the request of the Kenyan Fisheries Department (FiD) in the Ministry of Fisheries Development, this study has also identified potential alternative management measures to address the difficulties in managing this illegal fishing gear. The report is also designed to contribute to the FiD's revision of the Fisheries Policy and Act. Consultation meetings are planned by FiD to discuss the report, management recommendations and the implications for the revision of the Policy and Act.

II Acknowledgements

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III Table of contents

I Foreword 2
II Acknowledgements 2
III Table of contents 3
IV Acronyms & Abbreviations 4
V Executive Summary 5
1. BACKGROUND 8
1.1 Study background: the FAO code of conduct and the global study on Beach Seining 8
The Code of Conduct for Responsible Fisheries 8
1.2 Objectives of the Study 9
1.3 Material and Methods 9
1.4 Key technical terms and definitions 11
2. LITERATURE REVIEW 12
3. BEACH SEINING IN KENYA 14
3.1 Regulatory framework 14
3.2 Ongoing and previous initiatives related to beach seining 17
4. CASE STUDY 1: COAST 20
4.1 General context 20
4.2 Livelihoods and economic activities 20
4.3 Marine fisheries 21
4.4 Beach seining in the coast 25
4.4.1 Geographical distribution 25
4.4.2 Historical and social background 25
4.4.3 Results from the Study Area 26
4.5 Perceived impacts: environmental, social and economic 38
4.6 Perceptions toward the ban 40
4.7 Proposed alternatives to beach seining 40
5. CASE STUDY 2: LAKE VICTORIA 41
5.1 Description of the area 41
5.2 Livelihoods strategies and economic activities 42
5.3 Lake Victoria fisheries 43
5.3.1 Historical Background 43
5.4 Beach seining in Lake Victoria 44
5.4.1 General description 44
5.5 Results from the Study Area 45
Description of the area 45
Fish production 45
5.6 Perceived impacts 53
5.7 Proposed alternatives to beach seining 54
6. MAJOR FINDINGS, DISCUSSION AND RECOMMENDATIONS 56
6.1 Coast and Lake Victoria comparisons 56
6.1.1 Major similarities in the two locations 56
6.1.2 Major differences in the two locations 57
6.2 Recommendations 58
6.2.1 Recommendations for the Coast 58
6.2.2 Recommendation for Lake Victoria 61
6.2.3 Overall recommendation at national level 61
6.2.4 Final Considerations 62
Annex 1 : References 63
Annex 2: List of People Contacted 67
Annex 3 Images 68
Annex 4. Field Checklist and Questionnaire form 76

IV Acronyms & Abbreviations

AIG	Alternative Income Generating Activities
AIDS	Acquired Immune Deficiency Syndrome
BMU	Beach Management Units
CBD	Convention on Biological Diversity
CBO	Community Based Organization
CDA	Coastal Development Authority
CISP	International Committee for the Development of People
CORDIO	Coral and Oceans Research and Development in the Indian Ocean
CPUE	Catch per Unit Effort
DFO	District Fisheries Officer
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
FiD	Fisheries Department (MoF)
HIV	Human Immunodeficiency Virus
GDP	Gross Domestic Products
GoK	Government of Kenya
IUCN	International Union for the Conservation of Nature
IUU	Illegal Unreported and Unregulated Fisheries
LMEs	Large Marine Ecosystems
LV	Lake Victoria
LVFO	Lake Victoria Fisheries Organization
KI	Key Informant Interview
KMFRI	Kenya Marine Fisheries Research Institute
KWS	Kenya Wildlife Services
MCS	Monitoring Control and Surveillance (of IUU fishing)
MoF	Ministry of Fisheries
MLFD	Ministry of Livestock and Fisheries Development
MPA	Marine Protected Area
MSE	Micro and Small Enterprises
MSY	Maximum sustainable yield
NGO	Non-governmental organisation
PRA	Participatory Rural Appraisal
SGBV	Sexual and Gender-Based Violence
SWIO	South West Indian Ocean
ToT	Training of Trainers
WWF	World Wildlife Fund

V Executive Summary

In Kenya beach seines were prohibited through Fisheries Department legislation in 2001. Despite this ban, and the authorities' attempts to enforce it, the beach seine fishery is still commonly used both at the Coast and in Lake Victoria; at the Coast the use of beach seines is increasing. Attempts to replace the beach seines with other gear have proved to be not as effective as hoped.

In order to gain a better understanding of beach seining in the country, the root causes for its continued use and the difficulties in enforcing the ban, the newly established Ministry of Fisheries Development has requested FAO to include Kenya in the Global Study on Beach Seining currently being conducted by the Fisheries and Aquaculture Department of Rome Headquarters.

From January to May 2008, the NGO Coastal Oceans Research and Development – Indian Ocean (CORDIO) East Africa has carried out the study with the financial support of the FAO Sub Regional Office for Eastern Africa based in Addis Ababa.

In line with the term of reference of the study, a field survey has been undertaken in five landing sites (four in Coast Province and two in Nyanza Province) using participatory rural appraisal techniques and with the direct involvement of the local staff of the Fisheries Department. The follwing summarises the key findings and recommendations.

Fishers from both Lake Victoria and the Coast were well aware of the negative impacts caused by beach seining operations. The most notable examples cited by both groups of fishers was the destruction of fish breeding ground habitats and the capture of juveniles. These were caused by the bottom dragging deployment method used to haul the nets, and the fine mesh, respectively.

The most important positive impact of beach seining in both locations was income generation and employment leading also to food security from the consumption of part of the catches. In fact the catch sharing arrangements ensured that most of the fishing community benefit from the beach seine fishery. In addition, in both locations, the role of youth and women, the first especially during beach seining operations, the second more in marketing and processing of the catches was found to be very important.

Within the scope of the present study it was not possible to measure the total number of households involved in beach seining, but for the Coast the total number of fishers was estimated to be anywhere between 11,000 and 18,000 out of a total 65,000 artisanal fishers. At Lake Victoria there are estimated to be 4,676 beach seine fishers in Suba District where the field study was done. This District accounts for around 51% of beach seine fishers in the Lake, therefore a total of around 9,400 beach seine fishers may be operating in Lake Victoria (Kenyan waters). Dependency on this gear extends further if the following figures are used: 186,336 people are enumerated to depend on fishing and fishery related activities for their livelihood in Suba District. Using the rough calculation of 30% are beach seine related, this gives an overall figure of 112,000 for the whole Lake. Thus in total, in Kenya, probably around 20,000 fishers are using beach seines, and at least a further 200,000 people may be dependent on this gear for their food and livelihoods.

The use of the beach seine has persisted in both locations, despite the ban and despite the level of enforcement being higher in Lake Victoria than at the Coast. Beach seine use has increased over the last two years at the Coast.

The major difference among the two case studies is that the majority of fishers at the Coast were driven to the beach seine fishery due to a lack of alternatives, while fishers in Lake Victoria are attracted to the beach seine gear due to the rich Nile perch fishery associated with the gear and the ready market that is readily available for the landed fish.

The following management recommendations are proposed as temporary measures for the immediate term to address the difficulties in enforcement. They are put forward for discussion and consultation, particularly with the policy and management agency (FiD) and also the fishers themselves. We propose an iterative approach whereby options are put forward by different stakeholders and are then discussed and consensus reached on the most appropriate way forward.

This report constitutes management options put forward by a scientific research organization. (CORDIO). These then need to be discussed with all stakeholders.

A temporary lifting of the ban on beach seines at the Coast is recommended for a five year period during which the following management measures are introduced to effect a slow phase out of beach seines:

1. Introduction of a minimum 4 month closed season (October-January) for beach seines, articulated in the by-laws in all BMUs;
2. Establishment of "no beach seining areas" to protect the most sensitive habitats of the fishing grounds, articulated in BMU by-laws, and, where relevant, in concordance with KWS legislation;
3. Possible introduction of temporary beach seine net modifications involving limits on length, height and mesh size to be discussed with fishers;
4. Existing beach seine users are given special temporary licenses licensed under BMU/District level management to operate within the above restrictions;
5. Co-management mechanisms adopted through BMU by-laws and others to effect these temporary measures;
6. The impacts of the proposed management measures are monitored and evaluated yearly, in collaboration with local fishers through BMU structures.

The following recommendations are made for Lake Victoria as necessary complementary actions to the ongoing enforcement activities:

1. Fully assess previous gear exchange programmes and pilot experimental comparison of catches from hooks and lines vs. beach seines, to recommend a future gear exchange programme;
2. Discourage the market of catches derived from beach seining: strong controls of slot size at buyer level; introducing fines and legal actions against who buys/sells/processing undersized Nile perch; persecuting traders and processors and not only fishermen;
3. Complete the demarcation of the spatial closures that have identified the main breeding grounds so that they can be managed and monitored through the BMU structures;
4. Actively involve NGOs, BMUs leaders in patrolling actions to ensure broader participation and mutual involvement in MCS.
5. that a cost benefit analysis shall be undertaken by the FiD to estimate the cost implications and the feasibility of a total and continuous enforcement of the ban in Lake Victoria and share the results at the LVFO level to identify alternative enforcement options and more economical MCS arrangements.

Five national level recommendations are also proposed:

1. Initiate poverty reduction and alternative employment generation initiatives to minimise the economic incentive to return to beach seining: livelihood diversification activities are essential.
2. Introduce co-management complementary measures and develop them as by-laws enforced locally by co-management structures such as the BMUs to strengthen compliance.

3. Coordinate and link between Governmental and UN/NGOs' education, awareness and training programmes for fishers in co-management approaches and fisheries sustainability, in tandem with enforcement efforts.

4. Foster collaboration among Government, NGOs and financial institutions to enable fishers to access credit and microfinance services for the purchase of legal fishing gears.

5. Empower fishing communities to participate at the policy level in the formulation of fisheries and resource use regulations. This will have the dual benefits of incorporating their knowledge into the system, and reducing confusion and misunderstandings when it comes to implementation.

1. BACKGROUND

1.1 Study background: the FAO code of conduct and the global study on Beach Seining

Beach seines have been used in small-scale fisheries in many parts of the developing world for a very long time. In many cases, beach seining involves the participation of groups of men, women and even children and has a big impact on household food security especially among poor fishing households. Beach seines, also called haul seines, are typically small mesh nets in the range of 100m in length, that are set in shallow water parallel to the beach or back reef and are then hauled onto the beach or reef (Chapman in Kailola et al 1993, Malleret-King et al. 2003).

In recent years, the use of beach seines has been banned in some countries because of perceived negative impacts on the environment and resources. While scientific studies have been conducted in some places to determine the catch composition of the gear, there is no comprehensive analysis that addresses the social, economic and environmental impacts of beach seining. The following report represents part of a global study by FAO to provide a comprehensive assessment of beach seining globally. The study originates within the mandate of two primary FAO initiatives:

The Code of Conduct for Responsible Fisheries

To promote long-term sustainable fisheries, in 1995 the FAO Conference unanimously adopted the Code of Conduct for Responsible Fisheries. The Code, available in 12 languages, provides a necessary framework for national and international efforts to ensure sustainable exploitation of aquatic living resources in harmony with the environment.

The Code sets out principles and international standards of behaviour for responsible practices with a view to ensuring the effective conservation, taking into account the biological characteristics of the resources and their environment as well as the interests of consumers and other users. It also covers the capture, processing and trade of fish and fishery products, fishing operations, aquaculture, fisheries research and the integration of fisheries into coastal area management community on the progress achieved and further action required.

For the objectives of the current study, the most relevant part of the Code of Conduct, is the Technical Guidelines for Responsible Fisheries no 10 "Increasing the Contribution of Small-Scale Fisheries to Poverty Alleviation and Food Security". In particular, Article 6.18 states: ”Recognizing the important contributions of artisanal and small-scale fisheries to employment, income and food security, States should appropriately protect the rights of fishers and fishworkers, particularly those involved in subsistence, small-scale and artisanal fisheries, to a secure and just livelihood, as well as preferential access, where appropriate, to traditional fishing grounds and resources in the waters under their national jurisdiction”.

FAO, in accordance with its mandate, is fully committed to assisting Member States, particularly developing countries, in the efficient implementation of the Code. In fact, in adopting the Code, FAO member countries requested the Organization to respond to the special requirements of developing countries through an Interregional Assistance Programme for its implementation. The project Global Partnerships for Responsible Fisheries (FishCode) was thus established by the FAO Fisheries and Aquaculture Department as a special programme to promote responsible fisheries supporting the implementation of the Code.

Moreover, during the Abuja Declaration on Sustainable Fisheries and Aquaculture in Africa of 2005, the African Governments agreed to “implement the provisions of the FAO Code of Conduct for Responsible Fisheries, in particular through improved governance of fisheries, ensuring the

environmental sustainability of fisheries….and ensuring an equitable balance of resource allocation between small scale and industrial fishers."

Global study on the social, economic and environmental impacts of beach seining

The FAO Fisheries and Aquaculture Department, under its regular programme entity on sustainable and cost-efficient fishing technologies and infrastructure, started doing case and desk studies in 2006 to determine the social, economic and environmental impacts of beach seining. Case and desks studies have been conducted or are in the process of being conducted in Mozambique, Peru, Sri Lanka, the Gambia, India and Kenya. The consolidation of case studies previously conducted under the Sustainable Fisheries Livelihoods Project in Togo, Benin and Ghana is also being done.

The objectives of the case and desk studies are: (1) Determine the technological, environmental and socio-economic characteristics of the beach seine fishery; (2) Analyse the impacts of beach seining on household and national food security; (3) Analyse vulnerability, dependency and risk in the beach seine fishery; (4) Explore policy options for the beach seine fishery, and (5) Where legislation has already been enacted for the beach seine fishery, determine the implementation of such legislation.

Due to the problems encountered in the efforts to eradicate the use of this gear in Kenya, the Fisheries Department (FiD), now part of the new Ministry of Fisheries Development requested FAO to be included in the global study on beach seining. Kenya offers a valuable perspective to the global study as it has legally banned the use of beach seines.

1.2 Objectives of the Study

In line with the Terms of reference provided to CORDIO-EA, the main objective of the study is to provide a better understanding of the current status of beach seining in Kenya and generate additional information and recommendations for future policy decisions.

The specific the objectives of the study are:

(1) Determine the technological, environmental and socio-economic characteristics of the beach seine fishery in Kenya
(2) Analyse the impacts of beach seining on household and national food security
(3) Analyse vulnerability, dependency and risks in the beach seine fishery
(4) Explore policy and technical options for the beach seine fishery

1.3 Material and Methods

The study has been conducted in three phases:

1. Literature review
2. Field Survey at the Coast and at Lake Victoria
3. Data analysis and reporting

Literature review

The first part has focused mainly on the general aspects of beach seining in Kenya through the literature review and in the in-depth analyzes of the policy framework.

Bibliographic researches have been conducted from different sources as well as within the data available within CORDIO and the FiD offices.

The analysis of the policy framework has been conducted building on the reports compiled by the Fisheries Officers Mrs. Roseline Okwach (2008) from the FiD Kisumu Office at Lake Victoria and Mrs. Mwaka Barabara (2008) from the FiD Mombasa Office at the coast.

Field survey methodology

Fieldwork was conducted at four locations at the Coast and at two locations in Lake Victoria. Through consultation with the relevant local officers within the Fisheries Department, the six fishing community sites were selected based on the following criteria:

- Presence of Beach Management Units (BMU);
- Higher incidence of beach seine use among the fishers
- Accessibility during raining season
- Familiarity with the area either from CORDIO/FiD staff.

The methodology for the field assessment consisted of Participatory Rural Appraisal (PRA) techniques (Walters et al 1998) adapted in consultation with FAO and the FiD offices of Mombasa and Kisumu. Individual interviews were conducted by the project team with selected key informants (KI). The project team consisted of trained data collectors from the local community. Interviews used semi-structured interview forms (see Annex 4). The data collection and analysis at the Coast was led by Paul Tuda while the fieldwork in Lake Victoria was carried out with the assistance of the District Fisheries Officer from the Fisheries Department Office in Suba district, Mr. George Okoth.

The PRA in each community followed the following order:

- General introductory meeting with elders and local authorities;
- Transect familiarisation walk at the landing site and beach seining areas;
- Direct observation of fishing operation and beach seining and informal interview;
- Two Focus Group Discussion (FGD) with beach seiners and non beach seiners adopting a semi structured questionnaire (see Annex 4);
- Individual interviews with selected key informants (KI) using semi-structured interview forms (Ann4x 4).

During the FDGs fisher folks were guided through the first process of identifying the impact of the beach seine compared with the other fishing methods using a participatory visualisation exercise using a fixed number of stones of different sizes (Annex 4). This process helped highlight the different perceptions among beach seine fishers and non beach seiners on the contribution of beach seining to household and community economic and social structures. The FDG findings was later complemented and validated by individual interviews with KIs who were selected during the FGD as being proactive and as contributing during the discussions. The main objective of the KI interviews was to get deeper insight into some of the more delicate issues discussed during the FDG as well to get personal information and opinions. A total of 47 questionnaires were administered, 27 at the Coast and 20 in Lake Victoria. Individual fishers and households met during the transect was were also informally interviewed to obtain additional views.

The composition of the team for the PRA was composed of:

- One Data Collector from local community or from other BMU performing the following tasks:
  1. Arrange meeting venue and invite selected people to the meeting according to instruction
  2. Facilitate the meeting following the field guide, the checklist and the questionnaire

- One Field supervisor from CORDIO and/or Fisheries Department performing the following tasks:
  1. Backstop the data collector especially during focus group discussion meetings
  2. Make sure that data collectors are following the checklist and the methodology agreed

3. Write down all data collected during interviews and meetings

It must be noted that the field studies were limited by time and funds, and were not able to cover the entire shoreline both at the Lake and at the Coast. The data therefore provide representative information but not fully comprehensive information at the national level. In particular, the bulk of the illegal beach seining at the Coast occurs in Lamu District which was not visited, and at the Lake only Suba District was visited.

1.4 Key technical terms and definitions

Some commonly used terms in this report and are defined here for clarity (Table 1).

Table 1: Definitions of key words and technical terms from relevant literature

Coast	The coast is the interface between land and sea. Is a limited spatial area governed by complex physical, chemical and biological processes that gets its character from these direct interactions between land and sea, leading to a complex and fragile environment. *(Ireland et al. 2004)*
Artisanal fishers	Typically small scale fishers that fish to both sell their catch as well as take it home for food (subsistence), often using traditional gears and vessels but not necessarily. Modernisation of gears is common.
Ecosystems	A complex of plant, animal and micro organism communities and their non-living environment interacting as a functional unit.
Sustainable use	The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations. *(Source: CBD 1992)*
Livelihood	Livelihoods are defined as the way people combine their capabilities, skills and knowledge with the assets at their disposal to create activities that will enable them to make a living. *(Chambers and Conway 1992).* Livelihoods are diverse (*Carney 2002; Ellis 2000)* and are made up of multiple activities to achieve a desired outcome. Livelihoods are also determined by what assets and resources are available at the household level in terms of ownership and access *(Shamsuddoha 2004).* A livelihood is said to be sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resources base. *(*in *Ireland et al. 2004)*

Seining	"The use of a net to enclose an area of water and subsequently drawing the net ashore or to a vessel" (*Fisheries Act cap 378 Reg. nº 2*)
Ring net	"Small purse seines used to encircle a school of fish, usually in the deeper waters outside the reef" (*Young 2004*)
Mesh Size	Refers to the diagonal distance of the net mesh.
Cod End	Refers to the bag or sack at the end of a haul net (e.g. trawl or seine).
Slot size	Refers to a minimum and a maximum fish size limit. Thus the legal size of fish is between these two limits

When we talk of sustainable coastal livelihoods, we are referring to the process through which current and future generations of coastal stakeholders realise their potential by meeting their basic

needs and improving their quality of life whilst maintaining diverse, healthy and productive marine and coastal ecosystems (Ireland at al. 2004). In this document, the terms sustainable coastal management and sustainable coastal livelihoods all refer broadly to the need to strengthen livelihood opportunities for coastal people to achieve economic growth and poverty reduction in balance with environmental conservation and the maintenance of healthy coastal ecosystems.

2. LITERATURE REVIEW

Fishery yields from Kenya's shallow water lagoonal reef fisheries are declining and are considered to be overexploited (McClanahan & Mangi 2001, McClanahan 2007) and this has been attributed to an increase in effort and competition for dwindling resources and conflict (Glaesel 1997, McClanahan et al. 1997, King 2000, Malleret-King et al. 2003). More recent less traditional gears such as beach seines are held responsible for unsustainable fishing, are commonly disapproved of by traditional fisheries elders (McClanahan et al. 1997), are held responsible for the destruction of fishing ground habitats (Obura et al. 2001) and deemed to be the main cause of conflict between artisanal fishers (King 2000). Consequently, beach seining has received much attention in Kenya and remains one of the primary priority issues for fisheries management.

Previous studies have indicated that nearly two thirds of fishers use banned gears (McClanahan et al. 2005), mainly the beach seine and spear guns. The ban on beach seines has mainly been attributed to its degrading effects (Rubens, 1996; McClanahan et al. 1997), conflict between users (King, 2000), while its continued use has been ascribed to its competitive advantage (McClanahan et al. 2005) and the pressure to minimise costs (Obura et al. 2002).

The following publications are among the most relevant for the objectives of this study and therefore some of the findings and their recommendations are outline below:

Rubens, J. 1996. An analysis of the benefit and costs of marine reserve regulations at Diani, Kenya: The socio-economic context of resource conflicts between fishing communities and wildlife authorities. MSc Thesis. University of Newcastle.

The study examined the conflict between fishing communities and the Kenya Wildlife Service (KWS) at Diani, Kenyan South coast over the establishment of a Marine Reserve and the conflicts between the fishers over the use of the beach seine. The local fishers drawn from the primary landing sites in Diani-Kinondo area reported that the fishery had suffered tremendously due to the introduction of the beach seine by Tanzania fishers from the Pemba Island.

With the assistance of the local administration, the fishers formed a committee in an effort to curtail the use of beach seining because it was seen as being responsible for the removal of juvenile fish and damage to the sea grass beds. However, these efforts were complicated due to factors such as intermarriages between the locals and the immigrant fishers, economic dependence and the adoption of some local fishers of the beach seine. The information about the negative impact of the beach seine is further complemented by the fish catch data analysis which showed that the modal length of captured fish in seine nets is smaller than in other gears and that the juvenile fish smaller than 9cm are discarded before the catch is landed.

In the light of the above, the study concludes by stating that for the foreseeable future, the benefits of the fishing communities depend on continued reliance on fishing, and specifically on enhancing fishing productivity and this can by achieved partially by eradicating he use of beach seines.

Obura, D. O., Wanyoni I., and Mwaura J. (2001). Beach Seine Fishing In Galu and Kinondo Sub-Locations, Kenya. 13pp.

This study was conducted on the request of fishers from Diani Chale due to the escalation of the beach seining practiced in their fishing grounds by fishers coming from the neighbouring Gazi and Msambweni areas.

The problems identified by the local fishers as associated with beach seining activities included: declining fish catch, habitat destruction, destruction an displacement of fishing gears, invasion of the fishing grounds by sea urchins, increase in fishing efforts and increase in the number of fishers.

Rapid estimates of the benthic community cover conducted at coral areas used by the beach seine recorded an increase in algal cover and decline in coral cover below the normal coral cover of 20-35% for shallow Kenyan lagoon patch reefs.

The catch analysis indicated that, despite the overall catch of the beach sine much higher, the individual catch per fisher is relatively low compared to other gears due to the sharing arrangement between the crew, boat and net owners.

Obura, D. O. (2001). Participatory monitoring of shallow tropical marine fisheries by artisanal fishers in Diani, Kenya. Bulletin of Marine Science.

The study addresses the issue of gear selectivity and productivity and the inclusion of socio-economic considerations in fisheries management through the results of participatory monitoring of landed catch, underwater surveys and socioeconomic monitoring.

The result presents an analysis of data collected by trained fishers at the landing sites of catch by weight (Kg), gear, crew size, vessel type and count of individual fish species at six landing sites in Diani Chale.

Results indicate that the cost of gear highly influences gear choice with the high costs limiting the fishers from investing in their preferred choice. Therefore, the new entrants to the fishery prefer using the spear gun and the beach seine crew due to the low initial capital required. Joining of beach seining crews involves no cost to the fisher though it is associated with low per capita catch as compared to other gears.

McClanahan T.R. & Mangi S. (2001). The effect of closed area and beach seine exclusion on coral reef fish catches

This study was conducted to examine field data collected from landing sites in southern coast comparing the effectiveness of using management institutions, closed areas and gear management measure especially the exclusions of beach seines. Initiatives by the elders and the fisher's from1995 to 1998 led to a decline in the use of beach seines particularly in Mwaepe and Mwanyaza landing sites. In addition, most of the beach seines fishers stopped using the gear because their nets wore out and some got stolen. Consequently most of them opted for more affordable gill nets rather than purchasing new beach seines. However, the use of the beach seines continued in some areas particularly at night with catch being landed elsewhere far from the landing site.

The study indicate that the replacement of beach seines led to higher catches, confirming that due to its small mesh size, this gear competes with others rather than having its separate fish resource niche. Therefore is suggests that the establishment of further closed areas should be complemented with other management measures such as the elimination of destructive gears and alternative employment generating activities to reduce fishing efforts in a sustainable way.

Mc Clanahan T.R. & Mangi S. 2004. Gear-based management of a tropical fishery based on species selectivity and capture size. Fisheries Management and Ecology: 11, 51–60

The population density, species composition and lengths of fish landed by artisanal fishermen using six types of gear: large and small traps, gill nets, hand lines, spears and beach seines were studied in the multi-species coral reef, lagoon-based fishery of southern Kenya. Selectivity and catch composition among gears were determined by studying the species richness, diversity, size and mean trophic level of the catches for each gear type, to develop gear-based management

recommendations for this artisanal reef lagoon fishery. When compared with the other primary gears used in the artisanal fishery beach seines were found to catch higher numbers of fish, more species of fish and smaller sizes of fish. The authors recommended that the elimination or reduction of beach seines and small traps should reduce the catch of small fish and overlap in selectivity among the existing gears. They also go on to state that "in the case of a tropical fishery with diverse species and gears, gear use is often grounded in tradition and the existence of local resources required to build and maintain gears. Gear cannot, therefore, be adjusted with the same ease as mesh size in industrial or commercial fisheries. When conflicts exist for achieving sustainability it may prove effective to side with gears that are perceived to be more traditional, as this is likely to result in greater cultural acceptance and regulation compliance. Further, gear type is easily recognised and more easily monitored and therefore restrictions by gear type are easier to enforce.

McClanahan, T. R., Maina, S. and Davies, J. (2005). Perception of resource users and mangers towards fisheries management options in Kenyan coral reefs *Fisheries*

In this paper are presented the perceptions of Kenyan resource users and managers towards gear and area management in order to identify areas of agreement and disagreement and compare with compliance. Results indicate that the beach seining overlapped the most with other gears in the species caught, and it was responsible for catching smallest size fish. However fishers' perception in favour to beach seine use arguing for its sustainability. This suggests that the current restrictions in the Fisheries Act are either not properly communicated by enforcers and/or in any case not understood by fishermen.

For instance the study estimated that, while closed area restriction are mostly respected, both beach seines and spear guns are still used by nearly two-thirds of the local fishers despite their ban. Main reasons reported are the low cost of the investment needed for their use and their efficiency in the short term.

The study concludes stressing the need for active enforcement by fisheries managers.

McClanahan T. R. , Hiks C. and Darling E. (in press). Malthusian overfishing and efforts to overcome it on Kenyan Coral Reefs

This study examined trends along a gradient of fishing intensity in an artisanal coral reef fishery over a 10-year period along 75 km of Kenya's most populated coastline. The effect of two separate management strategies to overcome the expected decline on catch and gear diversity emerged by the study was investigated: fisheries area closure and elimination of beach seining as dominant and most ''competitive'' gear.

From this study emerges the strong interaction between closure and gear management, which indicates that for closures to be effective at increasing catch, there must be simultaneous efforts at gear management around the periphery of the closures.

The paper concludes that active management through reduced effort and reductions in the most competitive gear have the greatest potential to increase the functional and trophic diversity and productivity.

3. BEACH SEINING IN KENYA

3.1 Regulatory framework

The legislation relevant to this study is the Fisheries Act Cap 378 of 1989 (Rev. 1991, 2000). The scope of this law covers the legislation on the management, development, exploitation, utilisation and conservation of the fisheries resources within inland waters, public dams, swamps, rivers and

marine waters. The Act is implemented by the Fisheries Department (FiD) in the newly established Ministry of Fisheries Development (previously Ministry of Livestock and Fisheries Development) in conjunction with the para-statal organisation Coastal Development Authority (CDA).

The Act did not originally specify any restrictions on the use of the marine environment except the requirement for a license. Recognising the inadequacies in this Act for managing marine fisheries on a sustainable basis, the Ministry has issued subsidiary legislation to support the Fisheries Act (Cap. 378). For example, in 2001, in Kenya Gazette Notice No. 7565 Vol. CIII. No. 69 of 9th November 2001, the ban on beach seining and spear guns was introduced. In 2003, further subsidiary legislation was introduced (Legal Notice 214) to prohibit the use of SCUBA gear for collecting lobster and sea cucumbers.

The Act and its subsidiary regulations represents the primary instrument for the management of Kenya's coastal fisheries resources. It provides for the following powers to Authorised officers:

- Power to Control the Use of Illegal Gears and Methods:

  Trawl nets, harpoons guns, beach seines and monofilament nets are prohibited [Regulation 43(1)]

- Power to protect Fish Critical Habitats:

  Fishing is prohibited in designated areas and closed seasons identified for designated areas and species of fish [Section 5 -1 (a) (b)].

- Power to Control Capture and Trade in Immature Fish:

  Capture of *Oreochromis niloticus* (freshwater fish) of less than 25 cm total length is prohibited in Kenya, and it is prohibited to land from lakes Victoria and Turkana fish whose standard length is less than 25 cms [Regulation 43(5) (a) (c)].

Where the use of any gear is prohibited, the Director may also, by notice in the Gazette, prohibit possession of the gear.

With reference to seine nets, the Act specifies (par. 42.2 and 42.3):

1. Seining nets as fishing gears in Kenya fishery waters except for use in fish ponds and for *Rastrineobola argentea* ("omena", freshwater fish) outside closed season are prohibited.

This offence is punishable by a fine not exceeding 20,000 shillings or imprisonment not exceeding 2 years, or both. Beach seine fishing is prohibited in Kenyan waters.

The FiD introduced further subsidiary regulations under the Fisheries Act in 2005: The Fisheries (Beach Management Unit) Regulations of September 2005, under "Implementation of Fisheries Management Plan for Lake Victoria F.P.L.I.P and Co-Management Working Groups". These were fully gazetted in 2007 (Legal Notice 402). Beach Management Units (BMUs) are an innovative co-management tool for small-scale fisheries initially developed and gazetted in Tanzania in 2003 for the Lake Victoria Region. They are now also being applied to coastal fisheries in both Tanzania and Kenya.

The objective of the BMU Regulations is to facilitate the establishment of a BMU for each landing station in order to:

- strengthen the management of fish landing stations, fishery resources and the aquatic environment;
- support sustainable fisheries development;
- help alleviate poverty and improve livelihoods of BMU members through good governance and democratic participation and self reliance;

- recognise roles of different sections of the community including women;
- ensure high quality fish products;
- build management capacity of BMU members;
- reduce conflicts in the fisheries sector.

The Regulation defines a BMU as “an organisation of fishers, fish traders/mongers, boat owners, fish processors and other key beach stakeholders who have traditionally depended on fisheries activities for their livelihoods”. The Regulation also provides a legal framework for the operation of BMUs outlining structures, functions, roles and responsibilities of the different BMU organs such as the Assembly and the Executive Committee. The BMU has the primary responsibility of promoting co-operation among fishers and promoting a collaborative approach to the overall management of fisheries resources including enforcement of laws.

The primary legal structures through which the BMU operates is through its by-laws to be approved by the Director of Fisheries. Each BMU in cooperation with the authorised Fisheries Officer designate a co-management area which shall be an area in which the BMU shall undertake fisheries management activities jointly with the Director.

BMUs are expected to meet their own expenses using funds generated through levying fees, fines and other charges against its members or other users of the beach and from other external financial supports. While capacity may be relatively higher at Lake Victoria for operating such a system, most fishing communities along the Coast do not have yet the management capacity to fulfil what is required to effectively run a BMU. Most coastal fisherfolk are not organised and lack the capacity, skills and experience to begin undertaking tasks such as Monitoring Control and Surveillance (MCS), laws enforcement, conflict resolution and overall management of the resources.

Nvertheless, BMUs are rapidly being established at the Coast, and are seen as a mechanism for reducing conflicts between different gear users and for regulating the number of new entrants in to the fishery. With regard to beach seines, it is interesting to note that some BMUs have used their by-laws to guide fishers on the use of beach seines, while acknowledging it is a prohibited gear (verification that these by-laws have been approved by the Director of Fisheries was not however available). For example, the Gazi landing site BMU by-laws have a closed season provision for beach seining in the North East Monsoon (NEM) season, to reduce competition with fishers using other gears at that time. The BMU “allow” beach sening during the South East Monsoon season because this is the time of rough weather when most of fishers want to join the beach seine crews because their other fishing methods are too difficult in rough seas. In addition, at beach seine dominated landing sites, there is an age restriction for beach seiners in the by-laws.

Prior to the introduction of the BMU Regulations in the Fisheries Act, the management of fisheries resources has been the exclusive responsibility of the Government. The mandate has been given to the Fisheries Department initially under the Ministry of Tourism and Wildlife, since 2003 under the Ministry of Livestock and Fisheries Development, and since 2008 under the Ministry of Fisheries Development. This more conventional top-down approach marginalised artisanal fishing communities and other stakeholders in decision making. This has lead to increasing resource-based conflicts and little incentive to comply with regulations, a significant factor in a fishery that is difficult to enforce on the ground. This coupled with the lost of traditional authorities (elders) and local management capacities, and increasing human population at the Coast with few livelihood options. In recognising these issues the FiD has introduced a number of Subsidiary Regulations (see above) and in now undergoing a substantial review and revision of the Fisheries Policy and Act. The new version is expected to be finalised by the end of 2008.

The current draft of the Kenya Fisheries Policy includes a statement which affirms that: "The Department of Fisheries shall apply a co-management strategy in the management of fisheries resources." Under this policy statement, sub-headings include:

- The FiD in collaboration with relevant stakeholders shall prepare management plans for specific fishery
- The FiD shall incorporate community participation in fisheries development
- Fishing communities, through appropriately incorporated BMUs and in consultation with Fisheries Department shall be given exclusive rights to land at landing sites for fisheries activities

The above inclusions in the revised draft policy reflect the recognition by the FiD of the need to collaborate with resource users within its jurisdiction for effective fisheries management.

3.2 Ongoing and previous initiatives related to beach seining

There is a wide range of actors in the small scale fisheries sub-sector in Kenya. These include a few research and development/marine conservation agencies; input suppliers (local and imported); artisanal fishers; industrial fishing/processing/export companies; wholesalers/fish dealers, and retailers among others.

Nevertheless, there is limited communication and coordination among stakeholders. An integrated approach and collaborations among communities, private sector actors, NGOs and FiD have been sporadic and quite localised to date.

At the national level, the Fisheries and Aquaculture Department of FAO has provided technical assistance to the Government of Kenya (GoK) in formulation of the new fisheries policy that is now in the final revision process, which includes co-management as a priority. The current study is also designed to play a role within this revision process by contributing specific policy options regarding the management of beach seining.

With regards to Lake Victoria region, the same FAO department has also supported the Regional Plan of Action on the Management of Fishing Capacity of Lake Victoria which shows several potential linkages and collaborations among coastal and inland BMUs. In the Lake Victoria region, FAO Kenya is also piloting a Fisheries Farmer Field School (FFS) in Bondo to improve the management of the breeding grounds in the Lake. At broader level, several initiatives have supported fisheries livelihoods along the Lake Victoria region both In Kenya, Uganda and Tanzania.

The fisheries development programme that is most relevant to this study and that offers precious lesson learnt in terms of co-management is the project "Implementation of a Fisheries Management Plan for Lake Victoria" managed by the Lake Victoria Fisheries Organization (LVFO). The LVFO is a Regional organisation formed by a Convention signed in 1994 by the 3 Partner States bordering Lake Victoria. The programme, which, among many other activities, helped establishing 1087 community based BMUs on the shores of Lake Victoria, suggests that the improvement of the overall fisheries management including proper fish handling, processing and marketing as well as livelihoods diversification all need to be the main goals of co-management. In Lake Victoria this is being achieved not only by improving working and living conditions of fisheries stakeholders but mainly by increasing the BMUs' ability to co-manage their resources in a participatory and transparent manner. In the last two years, the success of the BMUs in Lake Victoria has induced the FiD to expand the co-management approach to the coastal districts.

The project Lake Victoria Environmental Management Plan II conducted a study in Suba District to compare the productivity of the beach seine and the long line. From the results the fishers were able to confirm that the long line fishers target larger Nile perch and get better pay compared to their beach seine counterparts. This result has particular relevance to the implementation of any gear exchange programs.

With regard to ongoing or past related interventions in the coastal area with specific reference to beach seines, two research organisations, CORDIO-EA and Wildlife Conservation Society (WCS) in partnership with the Mombasa based Coral Reef Conservation Project (CRCP) have undertaken a number of studies examining the artisanal fisheries on Kenya's Coast, particularly on the South Coast area (Diani) and the impacts of beach seining (see publications by Obura (CORDIO-EA) and McClanahan (WCS) reviewed in the Literature review above). In addition, the UK Department for International Development (DFID) commissioned a review entitled Understanding fisheries associated livelihoods and the constraints to their development in Kenya and Tanzania in 2003. All these studies have unanimously concluded that the beach seine is a destructive gear when operated within the coral reef lagoon habitats on Kenya's coast, have supported it prohibition (gazetted in 2001), but recognised that the socio-economic context of this fishery makes enforcement of this prohibition very difficult.

One study by WCS-CRCP specifically tested the impacts of an informal banning of beach seine by local communities at certain landing sites in Diani before the ban was formally gazetted. The results show clearly that sites that had excluded beach seine use exhibited increased total catch and CPUE.

CORDIO has had a long history of working with FiD through a participatory fisheries monitoring programme in the South Coast and recently through BMU capacity building activities.

The World Wildlife Fund (WWF) in collaboration with the FiD in Kiunga, northern Kenya sought to address the negative impacts of beach seining and the difficulties of enforcing the ban on the gear through a Fishing Gear Exchange Programme in Lamu district in 2006/07. The aim of the programme was to eradicate the use of illegal fishing gears including, beach seines, spear guns and monofilaments by giving soft loans to fishers through the existing co-operative structures. The repaid loan was used to purchase more gears for replacement. Over 600 fishers benefited from the program drawn from Kiunga, Mkokoni, Kiwayuu, Ndau, Kizingitini and Faza fishing villages. In the process 60 beach seine and 20 monofilaments nets were removed. In exchange the fishers were given gill nets of standard mesh sizes, snorkel apparatus for the lobster fishery and long lines. However several problems were encountered including:

- Weak fishers co-operative organisations
- Incapability of Loan repayment
- Poor coordination structures
- Inadequate number of gear for exchange
- Poor monitoring system
- Inadequate staff and other resources to carry out MCS enforcement by the government
- High illiteracy levels amongst fishers
- Lack of affordable effective and efficient alternatives to the readily available and cheap beach seines
- Lack of appropriate modern fishing technology by the fishers
- Resource user conflicts

As result of the above mentioned constraints, the rate of adoption of the replaced gears has been lower than the expectations and the number of beach seines has just slightly declined and has apparently resumed after the phase-out of the project.

A few other initiatives in the small scale fisheries sector have been carried out within the study area which have had an indirect impact on the beach seining:

- Eco-ethics international (EEIU) with Landing site, infrastructure development, post harvest techniques, capacity building and advocacy;
- PACT Kenya-capacity building, institutional strengthening and grant making initiatives;
- Kenya Red Cross financing capacity building programs for BMUs and distribution of basic fishing equipments and few storage facilities;
- CISP with gender based livelihood diversification pilot introduction in Malindi district;
- FiD, brief introductory training for BMU leaders on Orientation of roles of BMUs on Co-management, Fisheries and Financial management and provision of 18 Outboard engines to 18 selected BMUs.

The few initiatives focusing on capacity building have produced good results, management of the supported BMUs has improved and they seem to be stronger and more empowered, though still with significant leadership and organisational challenges.

Provision of fishing equipment to the BMUs members was less successful. As with the WWF experience, fishers provided with new fishing gear highlighted the low adoption of the same due to lack of proper knowledge on how to use the new equipment, illustrating the preference for using their traditional gear and methods.

4. CASE STUDY 1: COAST

4.1 General context

The Coast Province, along the Indian Ocean, is one of Kenya's eight administrative provinces. The Province covers an area of 83,603 km² with a total population of 2,487,264 inhabitants. The Province capital city is Mombasa with a population of approximately 1 million. Coast Province is divided into six administrative districts named from south to north: Kwale, Taita Taveta, Mombasa, Kilifi, Malindi, Tana River and Lamu.

The Kenyan Indian Ocean coastline stretches from the Somali border in the north to the Tanzanian border in the south, a distance of about 640 km located between latitudes 1°41'S and 5°40'S. The stretch has attractive sandy beaches ideal tourism related activities.

The coast has a narrow continental shelf with an estimated area of 19,120 km^2. For most parts, the width of the shelf is narrow. The total area of the Kenyan EEZ is 143,000 km^2. Kenya's coastal waters are still rich in marine resources and comprise a variety of habitats including coral reefs, river deltas, mangrove forests and seagrass beds among others. The shoreline of most of the coast and especially in the southern part is fronted by a fringing reef that lies between a few hundred meters to a few kilometres offshore, enclosing a lagoon. This restricts productive marine habitats close to shore and concentrates resource use activities within this area, particularly within the realtively weather protected lagoon.

The South East monsoon (SEM) winds ("kusi") and Northeast monsoon (NEM) winds ("kaskazi") alter sea temperatures, rainfall, wind and sea conditions. The SEM winds occur from April to October and are characterised by cool temperatures (mean = 26.40^{o}C, max = 30.0^{o}C), long heavy rains (55-272 mm/month), rough seas and strong winds (0.5-0.75 m/s); while the NEM occurring from November to March is characterised by warm temperatures (mean = 28.40^{o}C, max = 31-32.0^{o}C), short rains (8-84 mm/month), calm sea and steady light winds (<0.25 m/s) (UNEP, 1998; Obura, 2001).

The Coastal population has a mixed ethnic composition. Major local ethnic groups are all under the *Mijikenda* community that consists of 9 tribes: *Digo, Chonyi, Kambe, Duruma, Kauma, Ribe, Rabai, Jibana, and Giriama*. They share common customs and linguistic backgrounds. Those groups are now mixed and in some case intermarried with many others groups migrated from other inland regions such as Kikuyu, Luo and Kamba.

4.2 Livelihoods and economic activities

With few exceptions in the urban areas and touristic areas, communities along the coastline mainly depend on the marine and coastal environment and its associated resources for livelihood.

In general terms, the six coastal districts facing the Indian Ocean present more less homogeneous agro-climatic conditions and similar livelihood systems. The main fishing methods, as well as the seasonality patterns of the small scale fisheries are also similar along the coast.

Fisheries represent the main livelihood system for the coastal people followed by mixed farming, forestry and tourism (FAO 2006 - Fig. 1). Marine artisanal fisheries represent also the main source of employment in fishing communities directly and indirectly employing approximately 20,000 people, and providing monetary incomes to about 70% of the coastal population (FiD, 2006).

Sport fishing is also an increasingly popular activity in the area where tourists and residents are the main clients. This catch is sometimes difficult to quantify and evaluate as it is consumed locally or sold directly to hotels.

Apart of fisheries, alternative livelihood options range from mangrove cutting, agriculture, tourism, conservation activities, and sand collection, to livestock keeping and limited seaweed farming and mariculture.

Livelihood diversification in coastal communities is still low but several promising experiences have been initiated by NGOs, GoK and other development projects and are already bearing fruit.

These activities are diversified among the communities mostly due to the seasonal weather conditions or cultural beliefs, age differences, and seasonality, among other factors. For instance the low fishing season coincides with the rainy season thus some fishers resort to farming (agriculture) during the '*kusi'* season when the sea is too rough for fishing.

Agricultural production along the coast of Kenya is predominantly small-scale with the exception of a few coconut and sisal plantations. Sisal farming represent a source of temporary employment for local communities in Kilifi and parts of Malindi.

Nearly 50% of the arable land is under tree crops, which consist mostly of cashew nuts, coconuts, citrus and mangoes (UNEP, 1998) however their productivity is far below their potential due to several production constraints and inappropriate orchard management (Signa, 2007).

Many communities along the coastline and those in the Islands of Lamu mainly carry out fishing as exclusive mainstay. During low fishing seasons when the sea is rough they concentrate on repairs of their boats and nets rather than getting involved in other income generating activities. The younger men prefer to work in the higher- paying tourism industry as tour guides, boat riders or working in hotels while the older men would rather continue with their fishing.

Small scale aquaculture is still under-developed and carried out at experimental level. Shrimp culture has been piloted in Ngomeni area of Malindi district while mud crab fattening in Gazi and Mtwapa areas is being trialed. Kwale and parts of Mombasa have tilapia culture, though to a small extent.

Niches of markets for expansion and intensified production of local poultry are available, especially after the outbreak of the Rift Valley Fever, the demand for free range local chicken is extremely high and prices, both for eggs and meat, have increased.

Despite all these potentialities and possible alternatives, the dependency on natural resources in Kenyan coastal communities is still very high and the decrease in quality and quantity of the overexploited marine resources has lead to increased poverty levels. In 2006, the UNDP country report stated that the Coast Province had the highest rate of unemployment in the country at 62% and was the second poorest after the Western Province.

4.3 Marine fisheries

Kenya's marine fishing activities are practiced by three distinct sectors: (i) artisanal or small scale fishers concentrated inshore; (ii) industrial and semi-industrial fishers who operate exclusively within the 12nm territorial waters, largely prawn trawlers; and (iii) foreign vessels fishing in Kenya's EEZ waters beyond the 12 nm (currently 116 are licensed), with one Kenyan vessel among them (Samoilys et al. 2007).

The marine catch is estimated at around 7,000 mt. per year, represents approximately 5.0% of the total fish catch in the country and is given a value of KSh. 450 million (around 7 million USD) by FiD. Based on current marine fish values (around 180 KSh per kg) this annual marine catch may be worth closer to 20 million USD. The annual marine fisheries production in 2006 was 7,605 mt. (FiD 2006) and recent data from FiD estimate the overall marine fisheries production rising to over 8,200 mt. per year. Accurate estimates of the value of the artisanal fishery are not available due to poor fishery statistics. A crude estimation was calculated by Malleret-King and colleagues (2003) based on data from Diani: the artisanal fishery was worth around 1.03 million KSh. per km^2 per year. Using an estimated total area of Kenya's reef fisheries of 215 km^2 they suggest a total value of 248 million KSh, equivalent to 4 million USD, an estimate they say is very conservative because it is based on the most heavily fished and overexploited part of the Kenyan coast.

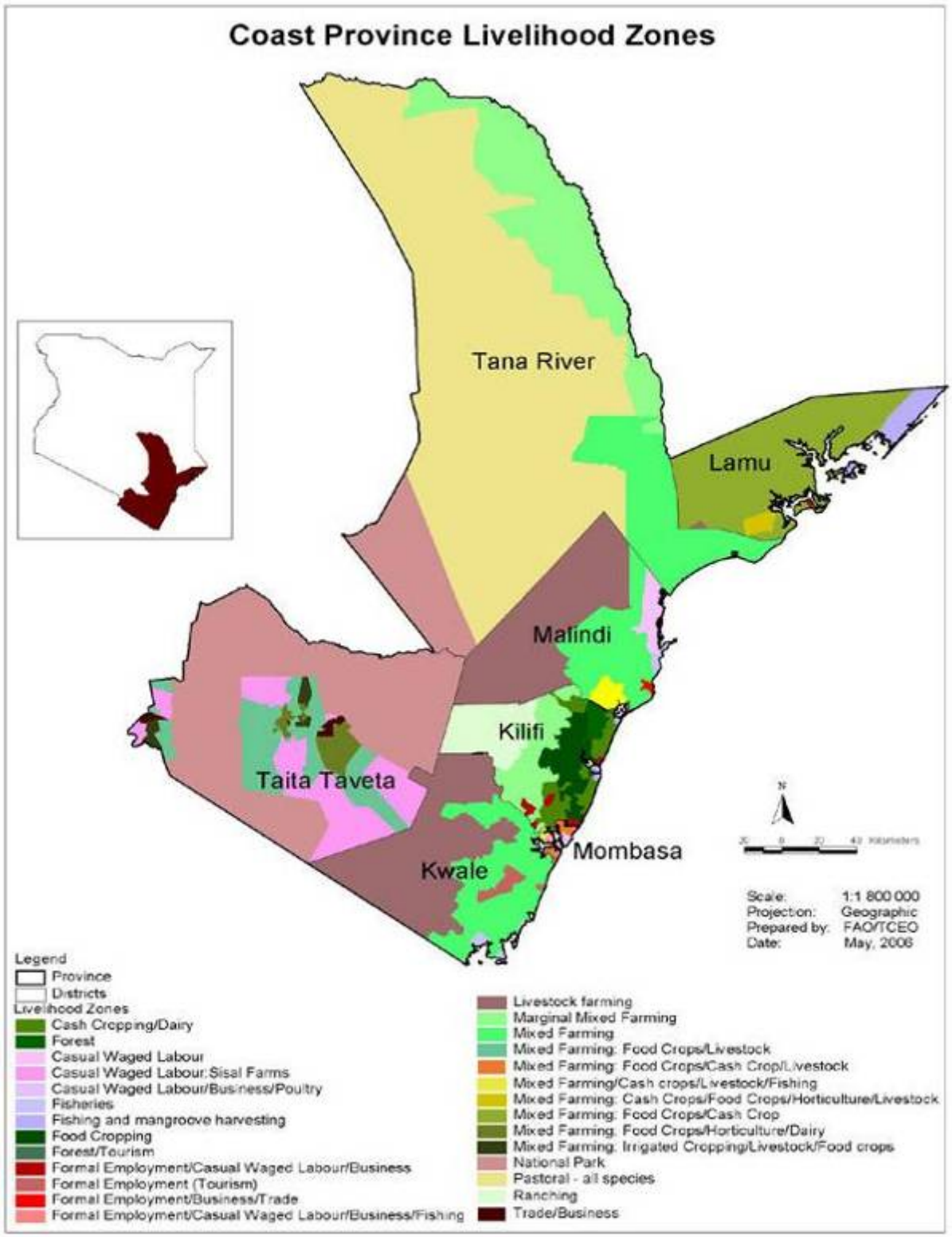

Figure 1. Livelihood zones in coast province of Kenya (Source FAO TCEO 2006)

This study only addresses the artisanal fisheries sector. Here, fishers operate from approximately 115 registered beach landing sites, but only 12 of these have any structures or facilities (Karuba and Abila 2007). The distribution of fishing intensity is reflected in the distribution of landing sites with 31% of all the landing sites in Kwale District in the South Coast, followed by Mombasa (21%), Lamu (20%), Kilifi (13%), Malindi (11%) and Tana River (4%). Comparing the 2006 to 2004 marine survey (FiD 2004, 2006), there was an increase of 12% in the number of fishers. This suggests

increasing numbers of new entrants to the fishery industry as seen in the following estimates of fisher numbers: 7,500 fishers in the mid 1990s; 9,017 fishers in May 2004; 10,276 in May 2006.

Artisanal fisheries

Currently, there are estimated to be 10,154 registered fishers operating 2,368 artisanal fishing vessels of various types (dominated by dug-out canoes and sail boats; less than 10% are motorised) most of which are operating and marketing their products individually.

Despite the apparent increase in the number of fishers and landing sites, 90% of the entire coastal fishery is still artisanal. The artisanal fishery includes a wide range of gear types the selection of which involves many historical and preference factors for individual fishers (Glaesel, 1997). The most common fishing gears include in order of priority: gill nets, long line hooks, beach seines, prawn seines, reef seines, cast nets, hand lines, monofilament, trawl nets, scoop nets, ring nets, trammel nets, trolling lines, spear guns/harpoons and trap/baskets.

Overall, the 2006 frame survey showed that the long line contributed 26% of all the gears enumerated, followed by hook and line, gill nets and basket traps (Barabara 2008, Figure 2). Beach seines only accounted for 2%. This official figure however, reflects misreporting since the gear is illegal it is unlikely that fishers will admit to using a beach seine. However, in the 2004 frame survey FiD did determine the number of beach seines in use and found a total of 294 beach seines throughout the 110 landing sites in the six districts along the coast.

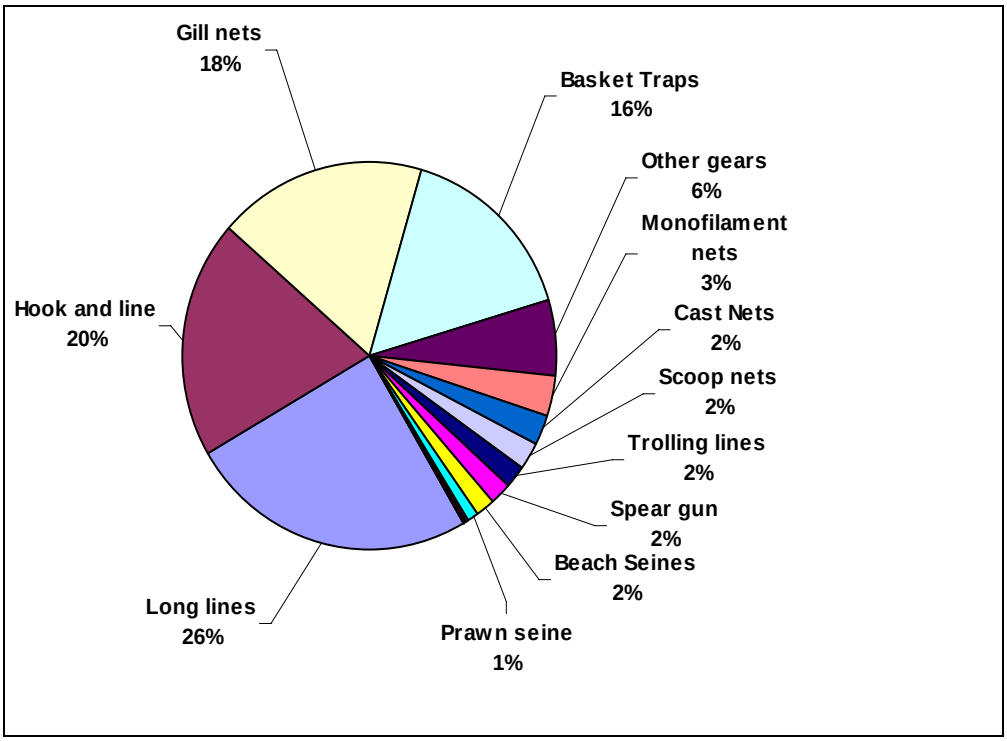

Figure 2: Gear composition in the artisanal fisheries in coastal Kenya (National frame survey 2006)

Artisanal fishing activities mainly take place between September and April during the calmer “kaskazi” NE winds rather than during the strong SE “kusi” winds.

In terms of post harvesting, very few communities are equipped with proper processing and market facilities to make optimal use of the fisheries resources, add value and hence provide better income from their livelihood (Barabara 2008).

The main market segments include household fresh fish market (which consume about 6,200 MT annually or approximately 88% of total marine fish production) hotel and restaurants fish markets in the form of completely fresh or moderately frozen (Karuga and Abila 2007). These two market outlets offer the highest potential for growth in demand and therefore income generation and

poverty alleviation. Other smaller market outlets include fishmeal export market, export processed fish market and ornamental live fish market.

Many fishers are still disadvantaged in market transactions by selling their catches mostly on an individual basis and in their primary forms. Using the BMU as a source of negotiating power or adding value to their fish has yet to be effected.

The lack of access to more effective boats and gear and the lack of refrigerated facilities are linked to lack of access to credit. Lack of credit facilities forces fishers to use gears which are affordable and which may not be sustainable. Without regular income, individuals have difficulties in getting formal loans (Malleret-King 1996). In addition, credit is very expensive in Kenya with bank interest rates of 20%-30%. As a result, fishers have set up groups, associations or committees since the collapse of Fishermen's Cooperatives.

The factors of reef geography, strong seasonality, small boats, restricted market and credit access and lack of ice and cold chain are all limiting factors that inevitably create the conditions that promote heavy use of the nearshore environment. The majority of artisanal fishing in coastal Kenya is focused on the habitats of creeks, reef lagoons, and shallow reef and seagrass environments which brings a diversity of species into the artisanal fisheries (Barabara 2008). The main marine landed fish groups include demersal species (about 42% of the total marine output); pelagic species (18%); shark and rays, small pelagic such as sardines (18%); crustaceans (11%); and molluscs (4%). It should be noted the demersal grouping is large and highly diverse, but a statistical breakdown of this group is not available through national statistics, only through individual projects (of which there are many).

Trends, management and governance

Although representing only a small percentage of total national fish catch, marine fisheries represent diverse fisheries resources with potential for growth compared to inland fisheries.

However, recent research argue that Kenyan marine fisheries are exploited well beyond the maximum sustainable yield (MSYs) of most species, and many of the fished ecosystems are heavily degraded in terms of biodiversity and ecological functions (McClanahan 2007).

The decline in marine fish landings is attributed to an increase in human population, destructive fishing methods that damage important fishery habitat (coral and mangrove), and recruitment overfishing due to the taking of juveniles. Certain fishing methods are of great concern due to their destructive and indiscriminate nature (Shumway, 1999). These include beach seines, the use of dynamite, long-line fishing, trawling and drift nets (Okemwa et al, 2004, Mueni and Mwangi, 2001).

Despite the recent introduction of the BMU system, the coastal artisanal fisheries in Kenya are still poorly managed. Lack of capacity and acces to technical and financial resources are reported to be the major bottleneck for the effective implementation of sustainable fisheries management and the new co-management system. Without the support required, and already provided in to the BMUs of the Lake Victoria, coastal BMUs will struggle to gain the skills and experience needed to develop by-laws, enforce any legislation, regulate fishing and preserve the marine resources.

These problems were confirmed during the BMU national workshop ''Opportunities and challenges for Beach management units in the co-management of the coastal artisanal fishery'' organised in November 2007, by CORDIO EA in partnership with FAO.

Numerous GoK reports state that "major impediments to project implementation by farmer and fisher groups in rural and coastal areas were lack of capacity, lack of skills and capital and that the solution is to "build capacity through training and community empowerment".

According to Karuga and Abila (2007), constraints in marine fisheries include:

- Inaccessibility and high cost of inputs primarily due to lack of retail outlets points near landing sites for the few input suppliers operating in the study region;
- Lack of appropriate fishing boats and gears capable of deep sea fishing where stocks are relatively more abundant at the moment;
- Low catch rate principally due to declining marine fish stocks and the inability of the majority artisanal fisher folk to undertake deep sea fishing;

- Inadequate exploitation of mariculture and aquaculture as an alternative to marine fishing resulting in high competition for available fish stocks which are also declining;
- Inadequate policy support and poor institutional coordination;
- Weak organisational and managerial capacity among the artisanal fisher folk;
- Lack of ice and cold storage facilities;
- Lack of adequate business management/entrepreneurial skills among the fisherfolks;
- Lack of appropriate market facilities and organised marketing systems;
- Lack of adequate and reliable market information;
- Problems associated with grabbing of landing sites by private developers and poor condition of roads network in many of the landing sites;
- Low value addition on the one hand due to high preference of fresh fish and on the other hand, lack of power/electricity in some of the landing sites;
- Lack financial banking services at the landing sites and low savings culture;
- Inadequate training on financial accounting and management.

4.4 Beach seining in the coast

4.4.1 Geographical distribution

Despite the ban, beach seining is still in use in several landing sites along the Kenyan Coast, and it remains one of the primary gears in coastal Kenya. Paradoxically, between 2004 and 2006 there was a 53% increase in the number of beach seines, from 294 to 560, seen in all the districts apart from Tana River (only 2) and Malindi where they decreased significantly (50 to 14), with the highest increase seen in Lamu District (Figure 3).

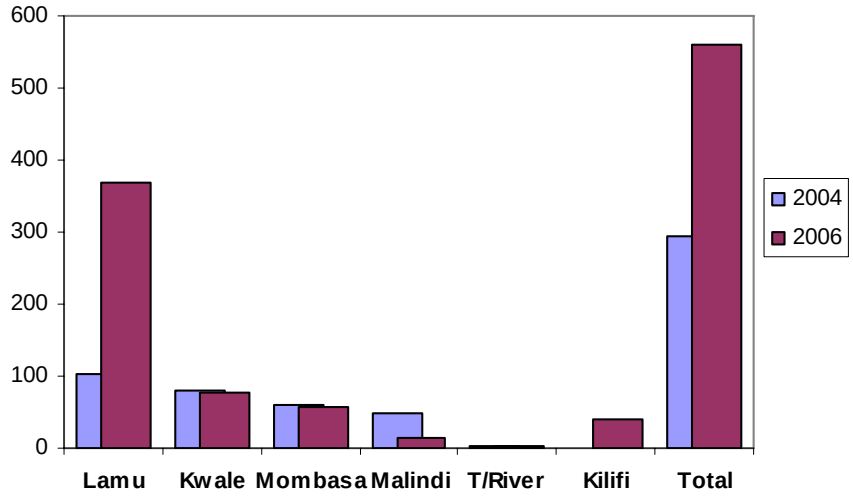

Figure 3. Numbers of beach seine by District in 2004 and 2006 by districts (*Source 2006 Frame Survey*)

4.4.2 Historical and social background

Historically the beach seine fishery is believed to have originated from Pemba Island in Tanzania, the fishers locally referred to as *Wapemba*. The *Wapemba* introduced the beach seine to Kenya in the 1960s following their first settlement at *Mvuleni* landing site on the Kenyan South Coast. The *Wapemba* fishers have since integrated with the locals through intermarriages and purchase of land making the beach seine more acceptable. There has been a continuous influx of *Wapemba* from Tanzania in to the Kenyan coast due to the decline of the fishery resources in Tanzania.

However, in the late 90s, there was an outcry by the local fishers over the deteriorating fish stocks linked to the use of the beach seine, leading to a confrontation with the *Wapemba* fishers. This forced most of the beach seine crews to move to less hostile areas further north towards Mtwapa, Mayungu Bofa and the Bajun Archipelago (Lamu District).

At the origin of this conflict was the fact that the beach seining practices disregarded traditional norms that guided fishing activities among the local dominant ethnic groups, particularly the *Digo*. Previous research in the area have documented that "traditional/religious" laws were mainly aimed at guarding fisherfolk against activities that were thought to have otherwise disturbed or angered the spirits (Glaesel 1997). Among these norms were prohibitions on fishing in areas where traditional sacrifices were made – the *msimus*, restrictions on fishing on days when sacrifices were offered, prohibitions on the use of harmful poisons for fishing, prohibitions on over-harvesting fish and the catching of young and juvenile fish. Incidentally, these norms had effects in conserving fish stocks promulgating the sustainability of the fishing livelihood. Over time these beliefs have weakened and most of these practices are now not respected or honoured by fisherfolk as many are seen as a restriction on how much fish can be harvested for a living.

Nowadays, along the coast, beach seine fishers are still highly migratory and visit fishing villages during the low fishing seasons associated with the SEM when the local fishers cannot venture out to fish due to the rough sea conditions. The beach seine fishers usually come in handy during this season due to their larger vessels and in many cases have homes among the fishing community.

Locally the beach seine is referred to as *juya* on the northern coast and *nyavu ya buruta*, *kukokota or nyavu kigumi* on the southern coast. *Kimia* refers to the fine meshed cod end.

4.4.3 Results from the Study Area

Status of beach seining in the area

The coastal survey of the beach seine fishery was conducted at four landing sites: Gazi, Nyali, Marina and Reef.

Gazi - South Coast

Gazi is located about 20 km south of Mombasa in Kwale district (Figure 1). Gazi has the highest number of beach seine fishers according to the 2003-2006 fishers census conducted by CORDIO, with the fishing community largely consisting of the Wapemba fishers. In this area, spearguns and beach seines were widely used before the ban (representing 39.3% and 25.9% of gears in the artisanal fishery, respectively (McClanahan and Arara 1996).

Gazi presents a rich example of the beach seine fishery and the challenges of enforcement because it is the most common and preferred gear in that area (Figure 5). The economic activities within Gazi revolve around fishing, agriculture and tourism and are heavily influenced by the SEM weather cycles (May – October).

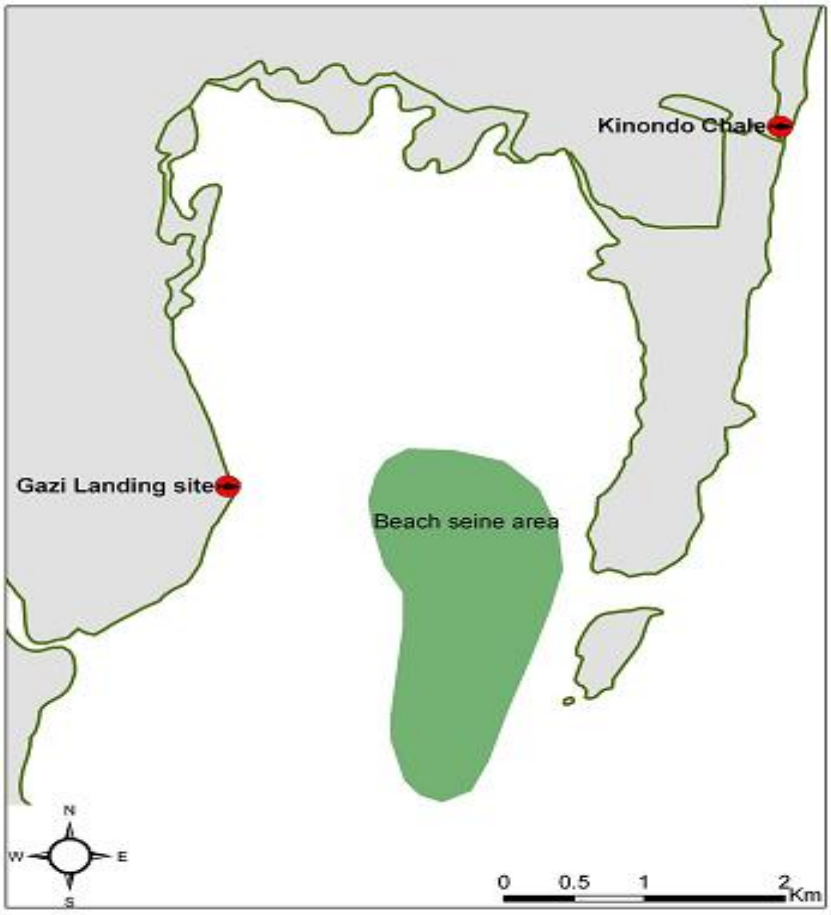

Figure 5. Map showing beach seine fishing zone in Gazi landing site Kwale district *(Source CORDIO EA)*

Fishing is by far the primary livelihood for Gazi community followed by small scale farming in few cases integrated as complementary activities during the low fishing/ rainy season. Fishing mainly takes place inside the reef and has led to pressure on overexploited lagoon resources (McClanahan and Mangi 2004).

Several monitoring projects are in progress with strong support from the community, largely fishers. They dominate fishing activities in the area besides being associated with illegal fishing methods such as use of seine nets.

Efforts by the FiD to enforce the ban in this area have not been successful. The area is also characterised by an influx of commercial fishers from areas such as Shimoni, Vanga and Pemba during the NEM season who come with sophisticated fishing gears.

Nyali, Reef and Marina Beaches - North Coast

The Nyali, Reef and Marina landing sites are neighbouring sites within the Mombasa Marine Park and Reserve (Figure 6) having a total number of members of over 250 fishers. Originally, the landing sites formed part of the Bamburi beach before the establishment of the Marine Park in 1986. However, most of the fishers were pushed out due to the enactment of stringent measures restricting fishing in the Park and permitting only traditional fishing gears in the Reserve.

The beach seine is the primary gear in these neighbouring sites and fishing takes place in the Reserve despite the restriction and frequent monitoring by the Kenya Wildlife Service on illegal gears. The fishing community is composed of both the locals and the Wapemba fishers who own the majority of the beach seines.

The Marina landing site lies in Mtwapa creek at the boundary of Mombasa and Kilifi Districts. The majority of the fishers in the landing site are drawn from the Giriama, one of the sub tribes of the Mijikenda community.

The Nyali landing site is divided in to two groups: Nyali Fishers and Msanakani fishers group landing their catch approximately 2km from each other. Close to Nyali landing site is Reef landing site which is mainly composed of fishers with a background from Wapemba. Nyali and Reef have been combined to form a Nyali BMU composed by fishers from both sites.

The three landing sites were involved in a recent fisher folk environmental awareness workshop that took place as a follow up of the 'Exchange and Exposure workshop on Marine Ecosystems and Sustainable Management' held in 2007 in Mombasa. Some of the key issues that this awareness workshop addressed were the use unsustainable fishing gear, Marine Reserve legislation and conflict of legislations. One of the major outcomes from the meeting was an action plan to determine the number of beach seine fishers and possibilities of phasing out the gear and replacing it with a more sustainable gear or venture.

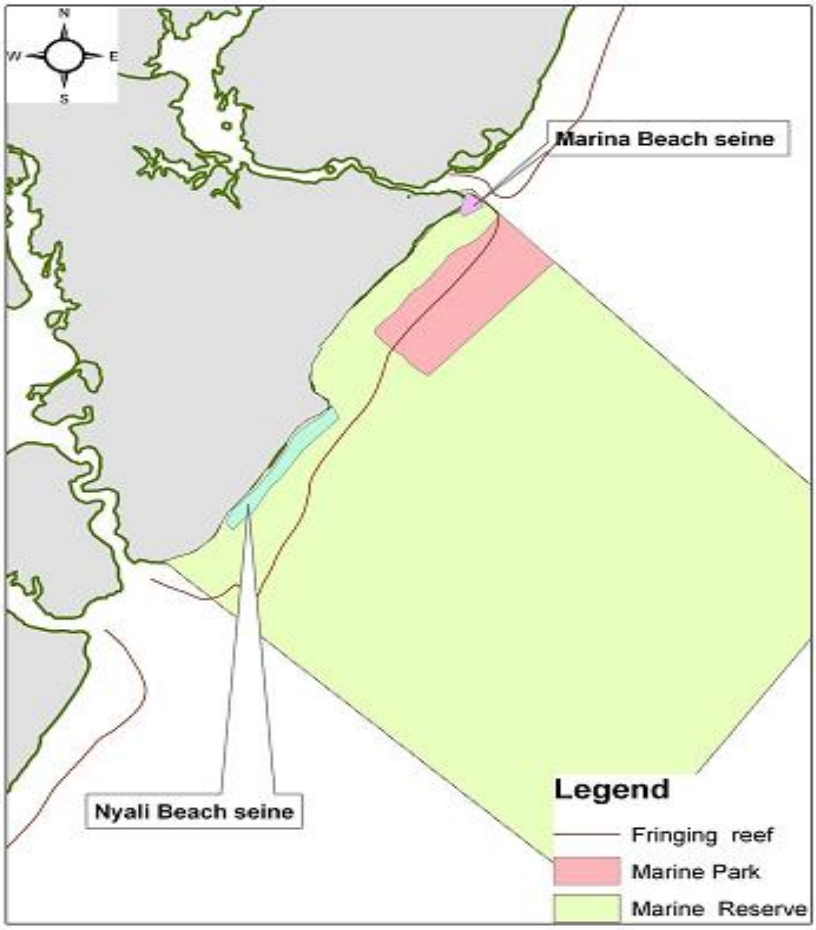

Figure 6. Map showing the beach seine fishing zones in Nyali area

Number of fishers involved

There was a negative correlation between the number of crew and the crew size at the four landing sites (Figure 7). This is because the more crews there are the more fishers can distribute themselves between the different crews. The Gazi landing site had more fishing options compared with the other three landing sites in which the beach seine was the primary gear.

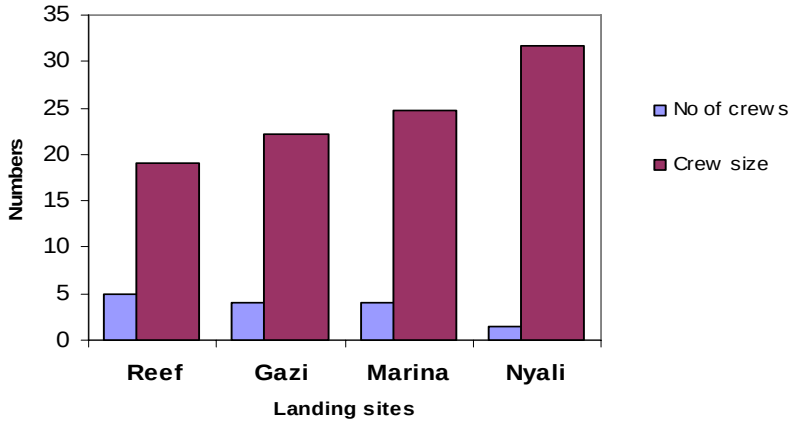

Figure 7. Number of beach seine crews and crew size by landing site

Age class distribution

The majority of the fishers were aged between 30-50 years (Figure 8). However, there were no fishers aged over 29 years at Reef landing site, whereas at Gazi the majority were over 29 years. This suggests a higher number of new entrants into the fishery at sites near the urban area of Mombasa, such as Reef, is likely to be associated with unemployed youths.

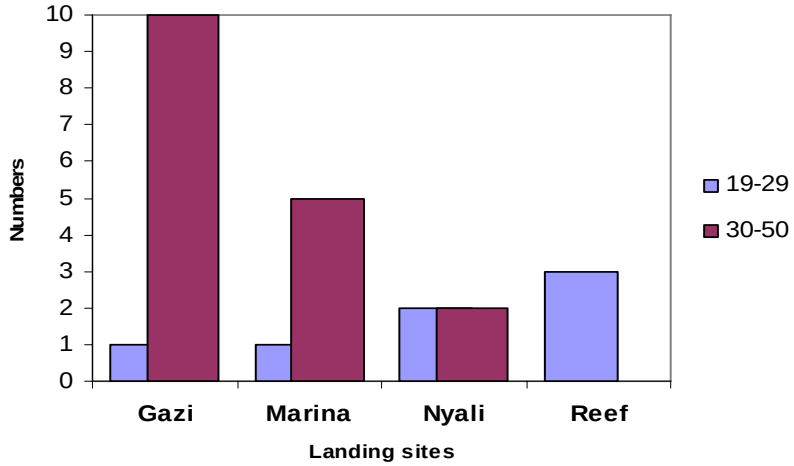

Figure 8. Age class distribution of beach seine crews by landing site

Length of net and number of pieces

The size of the beach seine depends on the number of pieces joined, depth of operation, number of fishers involved and availability of pull rope. A majority of the surveyed beach seines had lengths varying from 50 to 200 m. and depths of 2-10 m. with the average size used being approximately 120m. consisting of 2-8 pieces of nets. The mesh sizes tapered towards the cod end varying at different parts of the net (see Plates in Annex 3).

The fore wings had the larger mesh size ranging from 25-40mm. The body had mesh sizes varying from 18-27 mm. while the bag had finer mesh of 10 mm. The bag portion was long, but the majority ranged from 10 to 20 meters with a depth of 6m. The nets targeting sardine (*simusimu*) and Indian mackerel had finer mesh size of 1 mm. with some using mosquito nets at the cod end.

The beach seine without the cod end has a mesh size ranging from 1.5cm to 2cm consisting of two pieces of nets though this is subject to modification depending on the number of fishers involved. Nyali landing site had nets with no cod end but instead had a longer head rope with length of 100-400 meters. This is because the fishing takes place in deeper water and a canoe releases the nets. Some fishers observe the net underwater to release the net from snagging over coral and to facilitate faster pulling of the ropes.

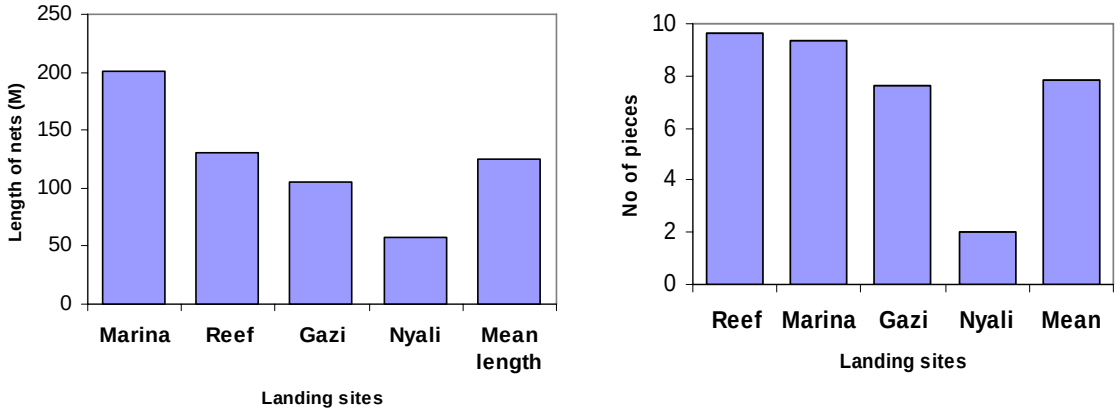

Figure 9. Left: Average Length of beach seine net by landing site
Right: Number of nets joined mesh sizes in different parts

Modifications made by fishers

The fishers increased the net coverage (sweep) by manually sewing additional nets of varying mesh sizes on to the main body, with a finer mesh sized net at the cod end. The cod end and the size of the rope used determined the local name of the net. *Kigumi* refers to the net without a cod end with a shorter rope compared to the length of the net while *Cha cha cha,* refers to the net without the cod end which has a longer head rope.

Fishing seasons/months

The SEM was the preferred season for the beach seine fishery at Gazi (Figure 10). Gazi landing site had multiple fishing gears, hence beach seining only took place during the SEM when the rough weather precluded the other more weather dependent gear. At Marina and Nyali the beach seine was used predominantly during the NEM. At Reef, the beach seine was the principle fishing gear and was used equally in both seasons.

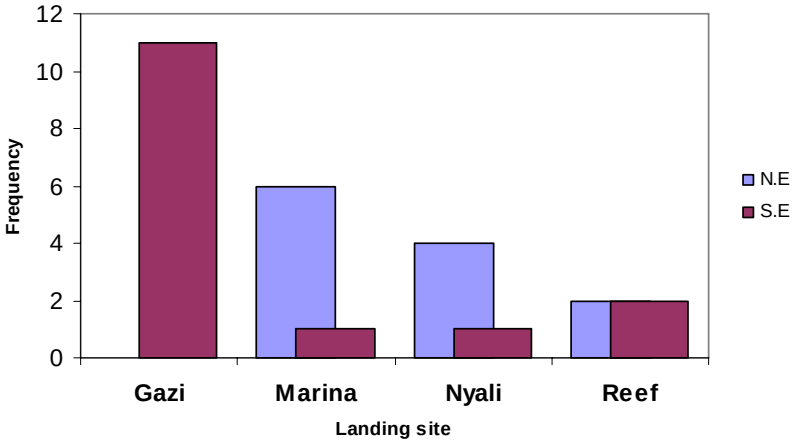

Figure 10. Beach seine preferred season by landing site

Catch composition, of beach seines

The parrot fish (Scaridae) and rabbit fish (Siganidae), both families largely herbivorous, represented more than half of the daily landings and at times made up the entire catch of the day (Figure 11). These were followed by emperor (*Lethrinus*) and barracuda (*Sphyraena*). Seasonally the catch is composed solely of sardines (Spratelloides) and the Indian mackerel (*Rastrelliger kanagurta*) targeted by specially modified nets. This period is commonly associated with an influx of fishers and a shift to the seine fishery. Table 1 provides a species list of all catches that were sampled.

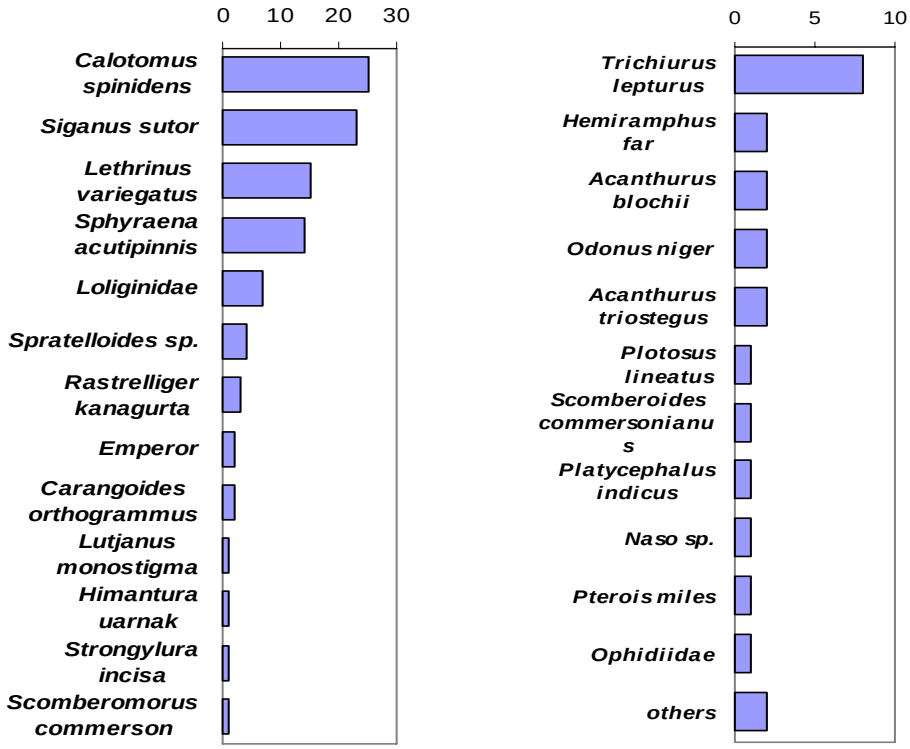

Figure 11. Left: Catch composition of beach seine nets by number of Individuals
Right: By-catch composition of beach seine by individual

By catch

The term by-catch in the beach seine fishery is mostly applied during the purchase of fish at the landing site; the fishers have no target species but have preference to some fish dictated by the fish traders depending on the species and size. Thus by-catch, refers to fish with lower market value due to unique traits such as smell, skin, spines or shape. These fish include (Figure 11):

a) *Coryhaena hippurus*- lots of spine and time consumed when preparing and eating;

b) *Acanthurus blochii*- strong smell when cooked;

c) *Hemiramphus far*- low market value;

d) *Sufflamen fraenatus*- tough outer skin.

By-catch also consisted of a large collection of juvenile fish of varied species collectively referred to as *bobwe.* Due to their low market value, the fishers carried these fishes home as part of their daily earning. With very few exceptions, no fishes have been observed being discarded.

Table 1. -List of common landed fish (includes by-catch)

Fam_Name	Scientific Name	Common Names
Acanthuridae	*Acanthurus blochii*	Surgeonfish
Acanthuridae	*Acanthurus triostegus*	Surgeonfish
Acanthuridae	*Naso sp.*	Unicornfish
Balistidae	*Odonus niger*	Triggerfish
Belonidae	*Strongylura incisa*	Needlefish
Carangidae	*Carangoides orthogrammus*	Trevally
Carangidae	*Scomberomorus commersoni*	Trevally
Clupeidae	*Spratelloides sp.*	Sprat/sardine
Hemiramphidae	*Hemiramphus far*	Halfbeak
Lethrinidae	*Lethrinus variegatus*	Emperor
Lethrinidae	*Lethrinus* spp.	Emperor
Loliginidae	*Loligo* spp.	Squid
Lutjanidae	*Lutjanus monostigma*	Snapper
Platycephalidae	*Platycephalus indicus*	Flathead
Scaridae	*Calotomus spinidens*	Parrotfish
Scombridae	*Scomberomorus commersoni*	tuna/mackerel (kingfish)
Scombridae	*Rastrelliger kanagurta*	Mackerel
Scorpaenidae	*Pterois miles*	Lionfish
Siganidae	*Siganus sutor*	Rabbitfish
Sphyraenidae	*Sphyraena acutipinnis*	Barracuda
Trichiuridae	*Trichiurus lepturus*	Cutlass fish
Dasyatidae	*Himantura uarnak*	Stingray
Diadematidae	*Diadema* spp.	Sea urchins
Plotosidae	*Plotosus lineatus*	Eel catfish

Productivity of the Beach seine

The mean daily catch recorded per crew ranged from a minimum of 13kg to a maximum of 400kg of fish with a mean catch of 74kg (Figure 12). The maximum catch occurred at least six times in a

month while the minimum catch occurred seven times in a month. For the most part of the month catches fluctuated depending on the season and the landing sites.

The projected income for the beach seines per landing site was determined by working with the number of beach seine crews at the landing site, the daily average catch per crew and the number of days fished in a month. With the current market price for fish at Ksh 180 ($2.90) per kg, the income of the beach seine crews varied from $ 107,458 up to $ 359,918 annually (Table 2). Nyali had the least number of crew and hence the lowest income, while Gazi had the highest income parlty due to the larger number of crew but also probably due to the long years of experience in beach seining and possibly a more productive fishing ground due to the proximity to the mangroves which are important fish breeding areas for some species. Reef had the highest number of crew and the highest number of younger fishers, giving an indication that these less experienced fishers may have contributed to less success in the fishing.

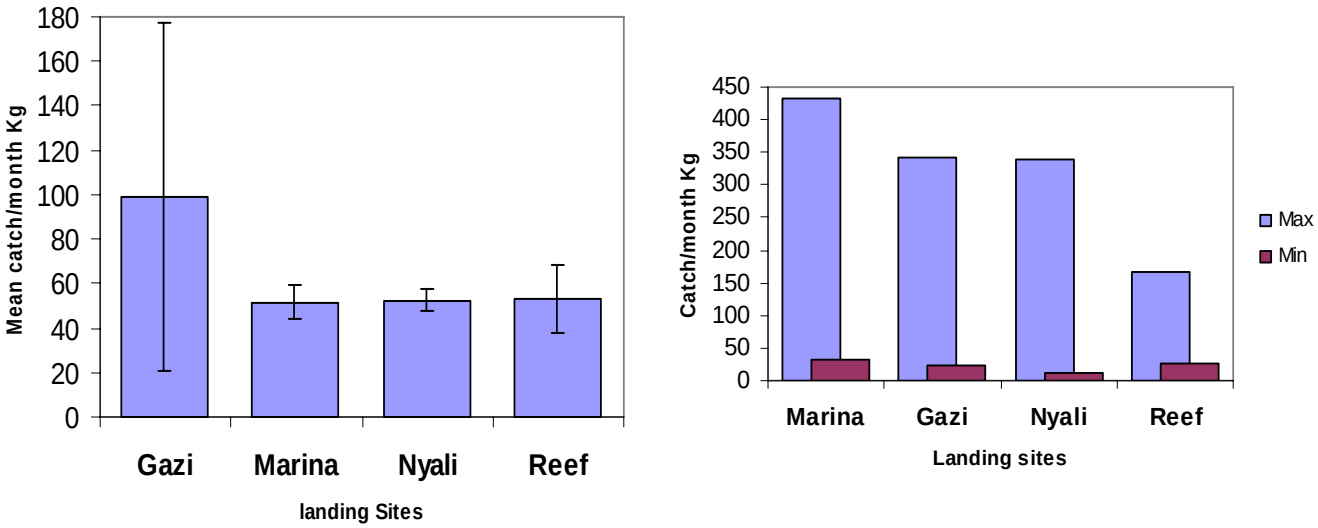

Figure 12. Maximum, Minimum and Average catch by a single beach seines crew

Table 2. Estimates (rounded) of beach seine income by landing site

	No of crew	Mean Daily Catch (Kg)	days fished/mnth	Current Market price/Kg $	Value of Landed Fish/month ($)	Value of Landed Fish/year ($)
Gazi	4	99	26	2.90	29,993	359,918
Marina	4	52	30	2.90	18,178	218,132
Nyali	2	53	29	2.90	8,955	107,458
Reef	5	53	26	2.90	20,071	240,855

Based on an average catch of 74kg/net/day and an average effort of 27.75 days per month, the coastal beach seine fishery is estimated to bring in 1,400 t per annum.

Distribution of catch

The distribution of catch depended on the total catch, gears, vessel ownership, and the crew size. The fish traders bought 75-100% of the entire catch while fresh, with an average of 10-20% was

retained for crew (Figure 13). Fishers carried 0.5-1kg home of as part of their subsistence (*mboga*) but largely benefited from the total sale depending on the distribution criteria (Plate 3, Annex 3).

In all four sites the captain takes 20% of the entire sale of fish as the owner of the gear/vessel while the crew divides the remainder. Obviously, the larger the crew size, the lower the individual benefit per fisher is.

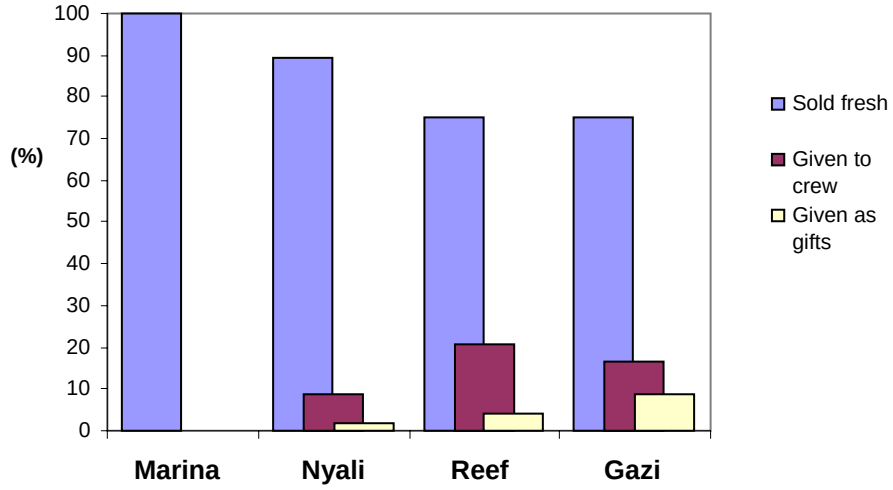

Figure 13 Distribution of beach seine catch

Sorting and utilisation of catch

The market preferences determined the sorting of fish with rabbit fish and parrot fish being most preferred. Species are categorised as either large or small, with large species fetching a better market value, even if they are small in size. For example a species like *Lethrinus variegatus* (emperor) is considered large while *Leptoscarus vaigiensis* (parrot fish) is considered small and fetches a lower price, even if the parrot fish size is bigger than the emperor.

Fish traders, particularly the middle-scale traders, prefer larger fish of particular species whereas the women traders often bought small species depending on their income. Fish trader sell the fish for local subsistence at the roadsides or in the market. However, the traders are usually unable to cope with the seasonal large catches of sardines. Therefore, these fish are sun dried and at times given to the villagers at a lower price due to oversupply. Processing is locally done by the fish traders at the landing site due to the availability of sea water, this mainly involves the removal of fish guts and scales.

It should be noted that the beach seine catch is very fresh with fish hauled ashore alive or only just dead, and therefore the catch can be considered high quality.

During the seasonal capture of sardines during March/April, which can go to as high as 3 mt., the traders usually transport the fish to Mombasa town as well as sun dry some for later sale.

Larger fish that are not sold fresh are also locally salted, by splitting them into half, salting on either side, and are then folded and covered in a sack and buried in the sand for 3-4 days.

Gear ownership

The captains owned most of the gears and vessels (Figure 14), and the majority interviewed in this study were Tanzanian from Pemba Island. Members of the crew were mainly local fishers and none owned a gear apart from one collectively owned by a Nyali fisher group (Figure 14).

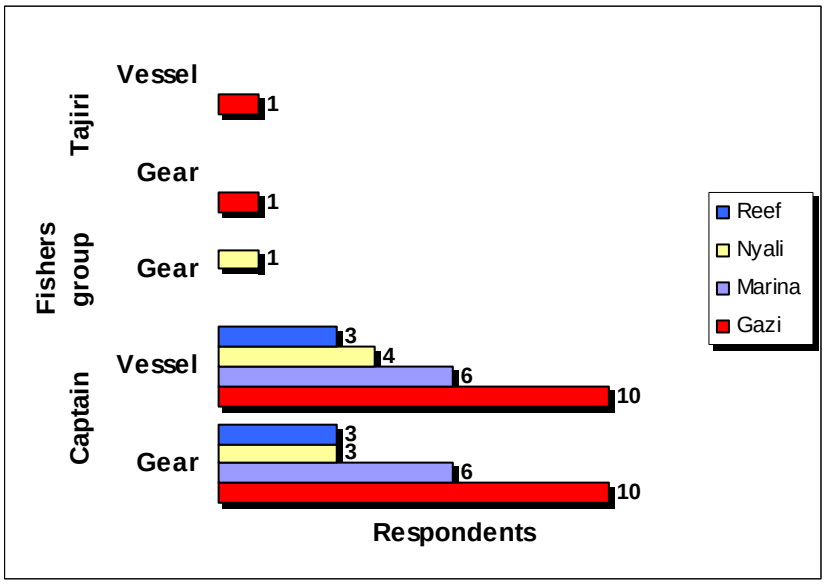

Figure 14. Patterns of gear and vessel ownership among landing sites

Initial and running costs for beach seine fishery

The cost of purchasing a beach seine varies from Ksh 35,000 for locally made nets up to Ksh 100,000 for manufactured net, and this varies with the length, depth and thickness of the thread. The price of a locally made dug out canoe varies from between Ksh 40,000 to 100,000, the costs of other expense like the floaters and the sinkers translate to between Ksh 20,000 to 40,000 depending on the size of the net. Together these costs indicate that on average one requires Ksh 200,000 to engage in a beach seine fishery (Table 3).

Table 3. Initial costs for beach seine fishery (1USD=62 KSh, May 2008)

Capital expenses	Item	Cost KSh
	Boat	65,652
	Net	99,364
	others	26,700
Total Capital		191,716

Gear supply, net making

The beach seine supplier most mentioned was Murtazi and Asma & Bro. all located in Mombasa. Fishers also bought second hand nets used by trawlers, and adjusted the mesh size. Those beach seines are easily recognisable by the different colours. The manually woven nets are the cheapest.

Conflicts

Interviews showed that the major conflicts existed between the beach seine crews, the basket trap fishers, the migrant fishers and the Fisheries Department (Figure 14). The most highlighted conflict between the beach seine and the basket trap fishers was conflict over fishing grounds. This is because both fishers use the sea grass bed as their main fishing grounds. In addition the beach seine fishers were accused of destroying gears and stealing fish from the basket traps.

Another common source of conflict was over the fishing boundaries between bordering landing sites. As previously mentioned, beach seine fishers are mostly migrant fishers who move along the

coastline in search of fish. In most cases, they stray to other territories outside their landing sites and this causes conflicts particularly due to their large and intimidating numbers. They are therefore blamed for the destruction of the fishing habitats and over fishing.

The conflict with FiD is due to the impoundment of the beach seine nets, which is perceived by the fishers as harassment despite the gear being illegal.

The conflicts reported were often locally resolved through the BMU committee with the Chief in attendance. Senior government officials such as the District Commissioner solved major conflicts involving compensation and boundary infringements.

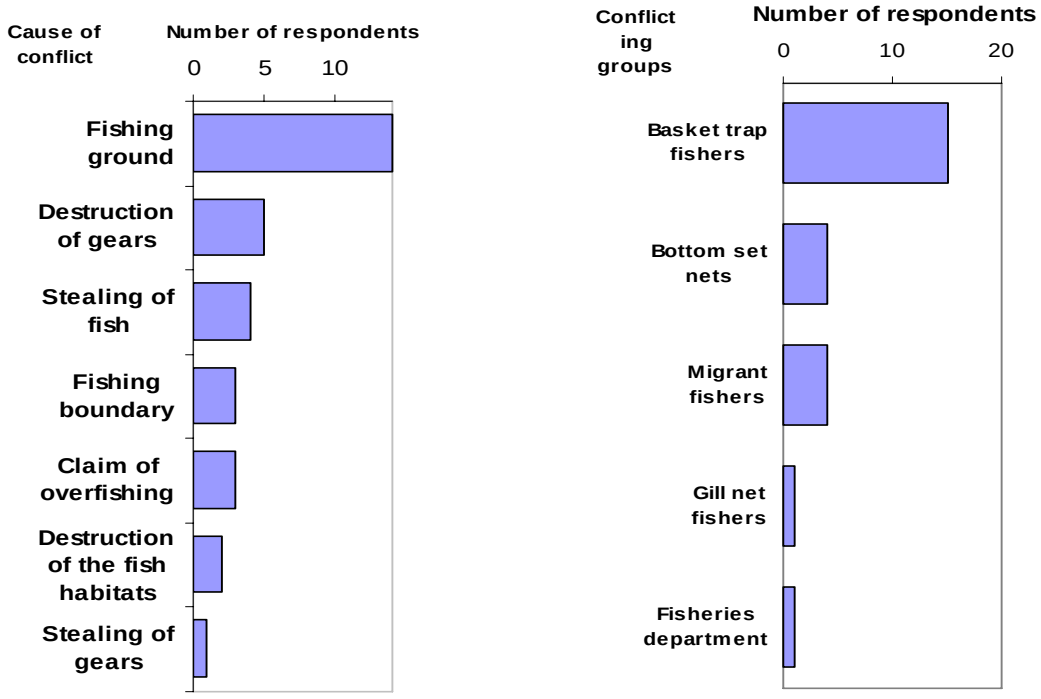

Figure 15. Left: Major causes of conflict

Right: Common conflicting groups with beach seine fishers

Enforcement and compliance of laws

All the fishers interviewed acknowledged the existence of Regulations governing the use of the beach seines. Over 80% were aware of the beach seine ban by the Fisheries Department. The primary reasons given by fishers for the ban were the damage caused by hauling nets over corals and other key fishery habitats, and the use of fine mesh size which captures juveniles, though a large portion said they had no idea (Figure 16).

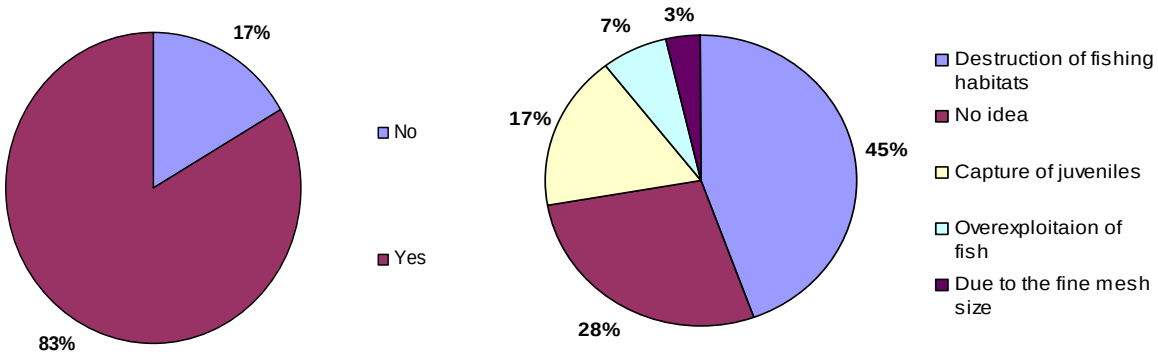

Figure 16. Left: Percentage of fishers acknowledging the existence or not of the ban on beach seines.
Right: Reasons given by those acknowledging the ban

Seventy nine percent of fishers openly reported minimal compliance on the use of beach seines (Figure 17) admitting that this is due to the low level of enforcement by FiD who rarely visit and impound the gears. It was also found that the BMU leaders had difficulty between enforcing the laws locally and maintaining their positions largely selected based on popularity. As such the use of the gears continues.

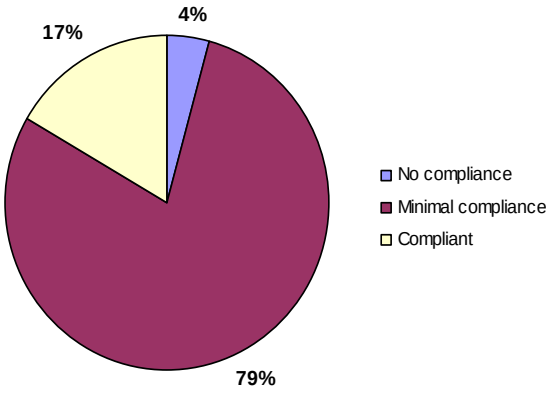

Figure 17. Fishers compliance to the beach seine ban

Within the coastal case study an interesting finding is the creation of BMU by-laws for guiding the use of the beach seine while acknowledging that it is prohibited. Acceptance of these by-laws by FiD seems unlikely though was not confirmed. This situation has arisen because of poor enforcement, recognition that the gear is destructive, yet also recognising the high dependence of local fishers on the gear. BMUs have therefore developed by-laws to try and reduce the conflicts with other gear users at a landing site and to regulate the number of new entrants in to the fishery.

A key management strategy found among these by-laws is the introduction of a closed season for the beach seine during the calm NEM season in order to reduce competition with other gears. This was found at Gazi. Since many fishers join the beach seine crew in the SEM season because they cannot use their other gears in the rough weather, this season is kept open. In beach seine dominated landing sites, another commonly found by-law was the restriction on age of fisher in the beach seine fishery.

4.5 Perceived impacts: environmental, social and economic

Environmental Impact

The field surveys carried out in the coast has confirmed that most fisherfolks are fully aware on the environmental impact of the beach seining. However during the FDGs, only 50% of the fishers acknowledged openly that the beach seine is destructive while the other half denied any damage caused by the gear.

Those in support of the beach seine cited the removal of the sea urchins (*Echinometra and Diadema* spp.) as a "positive" ecological contribution of the beach seine. However, it was clear that much of their support was tied to the fact that they depend heavily on the beach seine as their primary source of income.

Of the fishers interviewed 45% answered that the gear was banned because of its destruction to the breeding grounds and the sea grass habitats, whereas up to 28% said that they had no knowledge of why the gear was banned. A further 17% mentioned that the gear could have been banned due to capture of the juvenile fish (Figure 16, Table 4).

Table 3.Fishers' perception on negative and positive aspects of beach seines

Negative	Positive
Capture of juveniles	It is the primary source of income
Destruction of fish habitats	Beach seines remove destructive sea urchins
The beach seine destroys the sea grass	
Destroys fish breeding areas	

Social Impact

The field survey has highlighted the greatest impact of beach seining is employment generation and community involvement compared with the other common gears for two main reasons:

1. The beach seine is simple and mostly, except when done in deeper waters, involves the pulling of the net that does not require any skilled labor;
2. The beach seine requires a high number of crew members that varies from 10 up to 15.

For instance, the number of gears reported in the Frame Survey (Figures 2) does not reflect the actual number of fishers who are directly involved in the beach seine and hence its contribution to the coastal fishery. With an average of 15-20 fishers per beach seine crew, the estimated projection of fishers directly engaged in the beach seine fishery is between 8,400 and 11,200 fishers. This figure is disputed by the FiD because it surpasses the total number of artisanal fishers enumerated in the frame survey (~10,000). We would argue that the true total number of fishers involved in beach seining, essentially casual labour rather than conventional fishers, are highly likely to be missed during the frame survey. Our figure is not unrealisitic compared with that enumerated by Malleret-King and co-authors (2003) who estimated a total of 65,000 artisanal fishers in Coastal Kenya.

Considering also the number of people involved in other associated activities such a fish processing (largely women) and trading, others engaged part time in pulling the nets, the real contribution of the beach seine to the coastal fishery in term of employment generation will be even higher.

Another issue in the beach seine fishery is gender. Women involvement in artisanal fisheries in Kenya is generally very low and their role in the decision making processes is still almost zero.

However where beach seining represent a major fishing method as in Gazi and Shimoni (Malleret-King, 2000), women also participate in associated fishing activities in specific areas. Women are directly involved in the pulling of the seiners from the beach as well in the grading and sharing of the catches (see Plates in Annex 3).

Fresh fish trading is often left to men who sell it to residential areas and hotels outside the villages, hotels, or go to larger traders who own freezers. Women fish traders that mainly buy small amounts of small fishes to fry and sell in villages (so called mama karanga), are more numerous than men fresh fish traders and play an important role in the marketing systems (Wamukota, 2007).

Economic Impact

Three main economic advantages of the beach seine to the coastal peoples' livelihoods have arisen from the field survey:

- Direct and immediate economic returns;
- Low/zero financial input or technical ability required for crew members
- Indirect secondary economic activities.

Compared with other fishing gears, beach seining produces the greatest economic returns for both crew members and gear/boat owners in the short term. Due to its mode of operation, it also provides abundant catches because the gear is non selective. The second aspect of the fishery is that joining a beach seine crew only required the willingness to fish and very basic fishing skills, and in most cases the crew was entirely composed of fishers who could not afford gears. These two factors are considered to be the primary factors behind the poor compliance with the ban.

There are numerous secondary activities directly or indirectly dependant on beach seining such as traders, fryers, net suppliers and menders, shopkeepers etc (Figure 18).

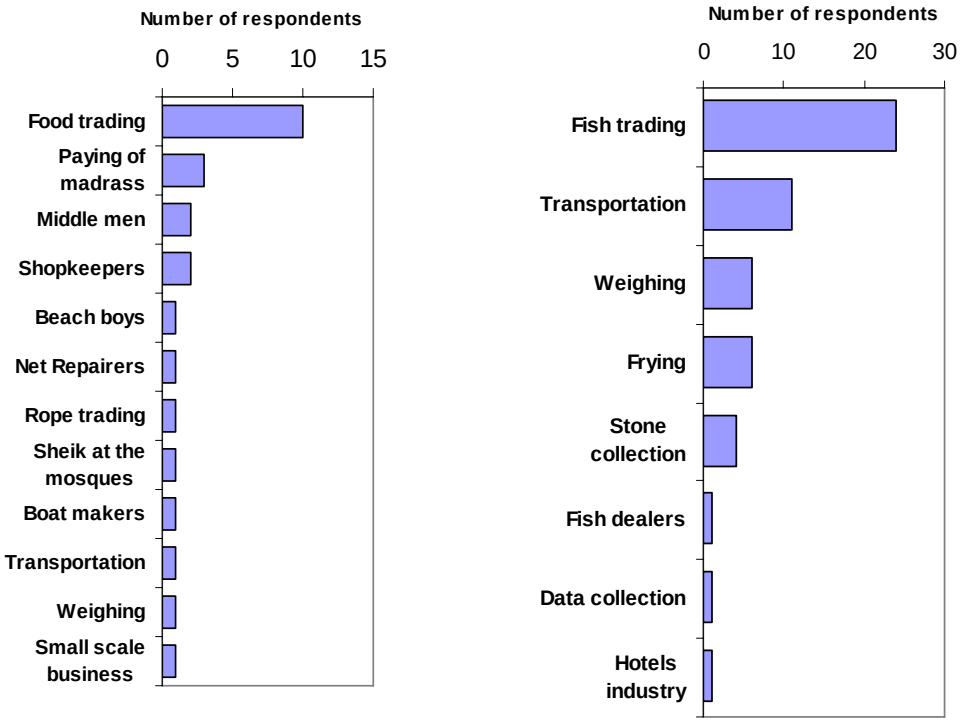

Figure 18. Left: primary activities dependant on the beach seine fishery
Right: Secondary activities

4.6 Perceptions toward the ban

For all the above mentioned reasons the ban on beach seines as the Coast is seen by a large portion of fishing communities as an action that will have a very negative impact on their livelihoods leading to further decline of poverty levels. The beach seiners interviewed feel victimised citing the ban as 'harassment' by FiD staff. They also stated that they cannot accept that the gear is banned without a consultative process.

The question is what proportion of fishers does this constitute, or rather what proportion of coastal communities are supported economically by the beach seine fishery. These are difficult questions to answer. But the figures obtained in this field study and from other sources suggest that at least 65,000 fishers are engaged in the artisanal fisheries (Malleret King et al 2003) of which perhaps anywhere between 11,000 and 18,000 (28%) are involved in beach seining (this study, McClanahan et al 2005), which may be generating a catch value in the order of 1.2 million USD annually (1USD=KSh 62, May 2008).

When the interviewed groups were asked to provide management or policy options they answered almost unanimously that the ban should be lifted and softer management options sought rather than imposing a complete and unenforceable ban. This result must be considered however, against the response that might have been given by non beach seine fishers (some 70% of artisanal fishers). Conflict between different gear users was one of the most significant issues in the beach seine fishery, and therefore it is likely that other fishers would not suport these statements.

Most beach seiners lacked alternatives, hence citing harassment by the Fisheries Department and the Kenya Wildlife Service as adversely affected their livelihood and dependants. All groups and individual interviewed criticised the fact that no alternative, neither in terms of other fishing methods or alternative income activities, have been promoted before the ban was set forcing them towards no compliance.

4.7 Proposed alternatives to beach seining

In terms of possible gears to the used as alternatives to beach seines, the fishers interviewed highly regarded the ring net, as the best option due to its high catch rates and large crews involved similarly to the beach seine. The gill net (locally called j*arife*) and hand line were also highly ranked. In terms of total catch, the ring net and the shark net are highly preferred, in terms of individual catch per fisher, the line fishing and the basket traps were much preferred.

When asked about ranking alternative fisheries income generating activities that could be accepted as an alternative to the beach seine, most of the beach seine fishers preferred small-scale business (Figure 19). They also preferred incentives that bring direct benefits to the individual fisher rather than having a collective venture. Collectively, poultry farming and dairy farming ranked highly, however the majority of fishers would rather practice crop farming individually as compared to poultry due to the labor involved in the latter and in some cases involving hiring of workmanship. It is interesting to note that aquaculture was not mentioned once. We would suggest that this reflects a lack of awareness of the potential for marine aquaculture (mariculture) in Kenya (Mirera and Samoilys in press), an issue that should be examined considering the urgent need for viable livelihoods and food security in coastal communities (Samoilys and Kanyange 2008).

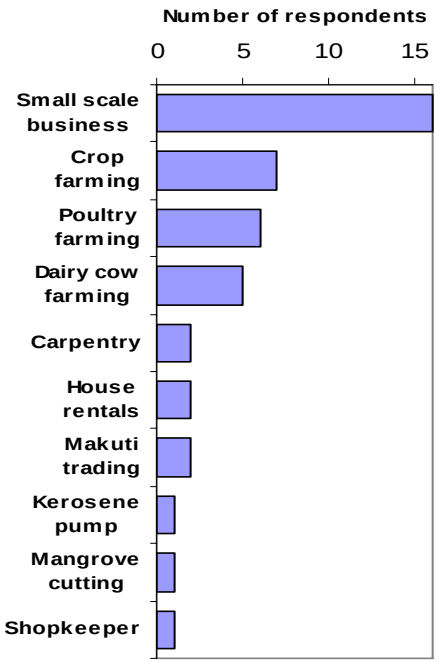

Figure 2. Incentives recommended by fishers as viable alternatives to beach seine fishery

5. CASE STUDY 2: LAKE VICTORIA

5.1 Description of the area

Lake Victoria is the second largest freshwater body in the World with a surface area of 68,800 km^2. The Lake falls within the sovereignty of Tanzania with 35,088 km^2 (51%), Uganda 29,584 km^2 (43%) and Kenya 4,128 km^2 (6%). It has a shoreline length of 3,450 km with a total of 31 districts with beaches distributed at varied geographical locations. According to 2006 Frame Survey, Kenya alone has a total of 316 beaches distributed in seven administrative districts named: Busia, Bondo, Kisumu, Nyando Rachuomyo, Suba, Homa Bay, Migori (Figure 20).

Figure 20. Map of Lake Victoria Riparian districts of Kenya, Uganda and Tanzania

5.2 Livelihoods strategies and economic activities

The Lake Victoria fishery supports a population of over 30 million people who are not favoured economically. Many fishers' households and women headed households, live below the poverty line.

The lucrative fish processing industry has yet to deliver any significant benefit to the most vulnerable groups and to the small scale fishers, which, in order to survive, are increasing their pressure on natural resources and on the fishing stocks (Okwach 2008)..

In general terms, there is an over-reliance on fisheries as the main livelihood on the Kenyan side of Lake Victoria similar, to that seen among Kenyan coastal communities. Another determining factor that can be considered an incentive to the over - reliance of fisheries is the fact that fishing in the Lake can be practiced almost is all year round. Moreover, most of the crews are regularly employed and depend entirely on the fishery for sustenance.

Apart from fishing activities, Lake Victoria fishers engage in other income generating activities, the highly ranked secondary income activity is poultry keeping (Figure 21). This may not necessarily be on a large scale but provides food directly, similar to crop farming, which is a common practice in rural areas where each person owns a parcel of land on which subsistence farming is practiced.

With specific regards to Suba District, boat transport remains the most active income generating activity that involves input of capital and expected profit or loss. There are inhabitaed islands within and therefore the only available means of transport is boat making it a lucrative business to those who have capital to invest in a boat.

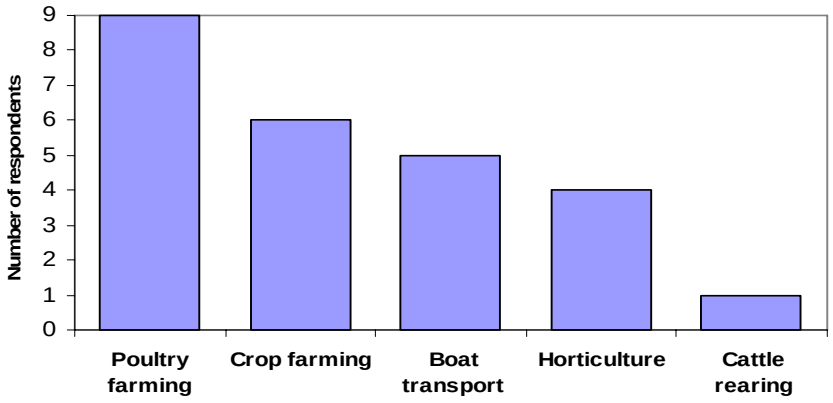

Figure 21. Secondary income generating activities engaged by beach seine fishers in Suba District

5.3 Lake Victoria fisheries

The fishery yield from the whole lake is estimated at 700,000 - 800,000 mt. valued at USD 350 – 400 million. The fishery provides raw material for about 30 factories with a capacity to process about 1,800 tonnes of fish per day. The Nile perch fishery which dominates the industry is the main target of gillnets, beach seines and long lines, the most common gears in the region. The value of this fishery is reflected in the management, regulation and research attention the lake has received from the goverment of Kenya, in contrast to the Coast (Okwach 2008).

5.3.1 Historical Background

Until the mid 1970s the fisheries of Lake Victoria were exploited solely by small scale fishermen. Very few fishermen possessed more than one canoe and normally the boat was operated by the owner and relatives and/or other men from the community. Processing and trading was dominated by small scale operators, most of them women from the communities. The government collected statistics and formulated regulations. These were, however, rarely enforced (Okwach 2008).

There was in principle an open access to fishing grounds, but in practice local rules were developed by the communities. These rules stipulated who may fish, during which season, what type of gear to use and size of fish to be caught. Total landings of fish were around 100,000 mt. per year for the whole lake. There was a great variety of fish species in the lake.

During the period 1980-85 fishing for Nile perch developed rapidly. The fish had been introduced in the lake in the 1950s and, being a predator, it feeds on most of the species in the lake. By 1980 the composition of fish caught in the lake had changed drastically; from a multi-species fishery to a “three species fishery” where the Nile perch was the dominant species followed by small sardines (d*agaa)*. The third part of the catch was made up of other fish, mainly Nile tilapia, another introduced species that had replaced many of the indigenous tilapia (Okwach 2008).

Fish was still sold at the local market, that initially had problems to absorb the increasing catches of Nile perch. Many people around the lake also did not like the “oily and fat“ fish. However, after only a few years the fish became more popular and spread to new markets all over East Africa. During these years the Nile perch became a popular fish with an affordable price in wide areas around the lake and many new jobs were created for fishermen, processors and traders. It is estimated that an additional 180,000 jobs were created in the 1980s (Okwach 2008).

From 1985 the fish processing factories that export Nile perch fillets to markets in the industrialised countries began to appear. An increasing part of the Nile perch was withdrawn from the local and regional markets. This had two effects: the amount of fish available for local consumption started to decrease and employment opportunities in the processing and trading sector started to disappear. Traditional processing methods such as smoking and salting have to a high degree disappeared, save for the most remote places. This new development has drastically reduced employment opportunity, especially for women. It is estimated that for every job created in the fish processing industry, 4 - 9 jobs are lost in the traditional sector (Okwach 2008).

5.4 Beach seining in Lake Victoria

5.4.1 General description

The fishery of Lake Victoria has undergone major transformations since the 1980s when fish catches increased following establishment of Nile perch (*Lates niloticus*). Fish processing plants and exports of fish products emerged, and fishing pressure on the lake increased rapidly creating fears that the fishery may not be sustainable (Okwach 2008).

The bi-annual Kenyan FiD Frame Surveys conducted regionally provide the statistic of various fishing gears, fishermen, boats in Lake Victoria. The results of the statistics of beach seines have been taken from the 2000 to 2006 surveys (the next is due this year, 2008). The number of beach seines is declining - from 869 in 2004 to 553 in 2006 (36% drop). In previous years the number of beach seines in the Kenya Lake region with in the thousands (Figure 22). The current usage of beach seines is only 10% of the numbers recorded in 2000 Frame Survey.

The district data (Figure 23) highlight that the highest numbers of beach seines were found in Suba (51%) followed by Bondo (29%), Busia (6%), Rachuonyo (5%), Migori (3%), Nyando (2%) and finally Homa Bay with less than 1%.

Beach seining in Lake Victoria employs an encirclement technique, where small boats lay out the nets, across a bay or suitable catchment area and the nets are then hauled up onto the beach. Beach seining is done in the littoral waters where fish breed, spawn and shelter. Such sites are very vulnerable to destruction by a dragging beach seine.

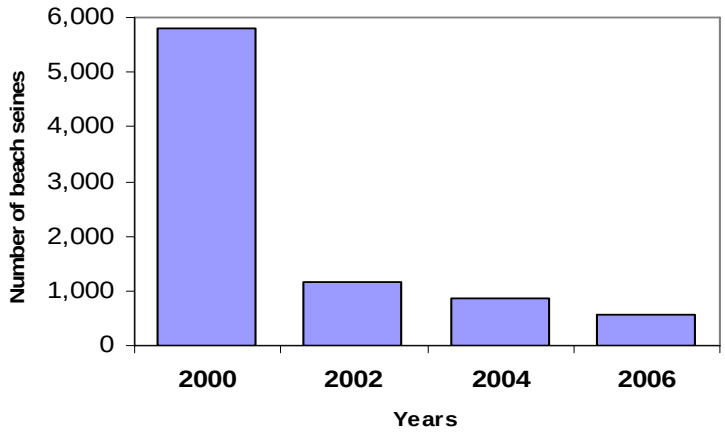

Figure 22. Decline of beach seines in LV from 2000-2006

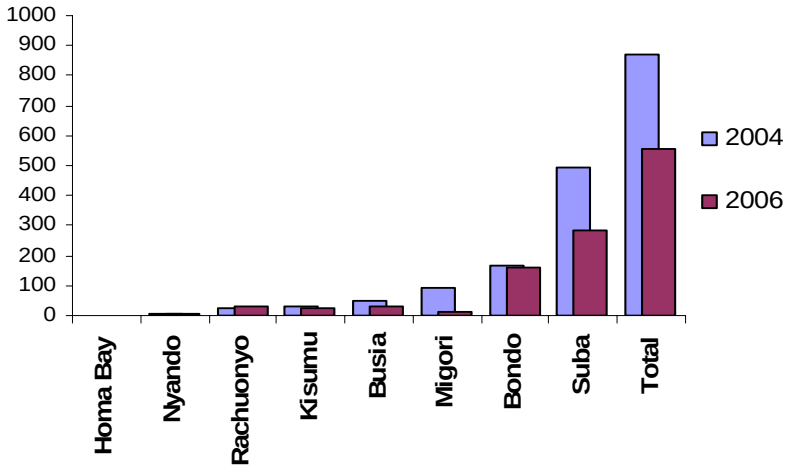

Figure 23. Comparisons of beach seine numbers

5.5 Results from the Study Area

Description of the area

Suba District was carved out of the greater South Nyanza District in 1995. It neighbours Bondo District to the North, Homa-Bay to the East, Migori to the South, and Bugiri District of Uganda to the West (Figure 20). It has a shore line of about 222 km and area of 1788 sq km of which 737 sq km is covered by the waters of Lake Victoria.

There are 16 islands in Suba District. Out of these only Mfangano, Rusinga, Remba, Ringiti, Takawiri, Kibwogi, Ngodhe, Kiwa and Sukru islands are inhabited. The islands provide very rich fishing grounds.

Suba has a total of 108 fish landing sites, both on the mainland and the islands. About 15,585 fishers operate at the landing sites. A further 186,336 people depend on fishing and fishery related activities for their livelihood in Suba District.

Fish production

Suba District produces about 60 % of the fish that is landed on the Kenyan side of Lake Victoria. The current production is put at about 56,000 mt. which is considered conservative. The actual production could be in the region of 100,000 mt., valued at Ksh. 2.4 billion. The main fish species that are landed include Nile perch (*Lates niloticus*), Omena (*Rastrineobola argentae*), Tilapia (*Oreochromis niloticus*), *Protopterus*, *Momyrus, Schilbe*, and *Haplochromis* (Figure 24).

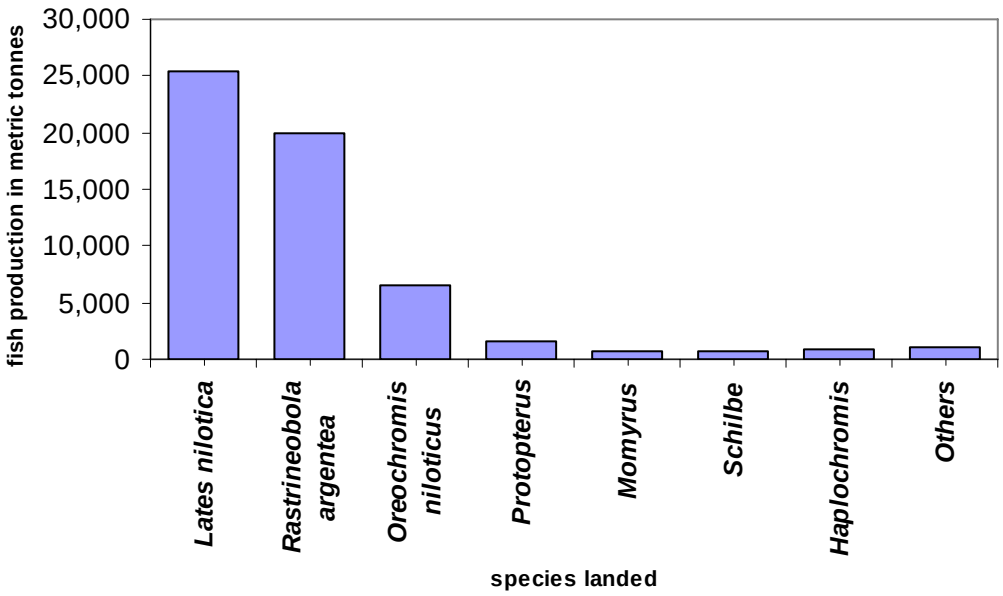

Figure 24. Common landed fish species in Suba District

Fishing Effort and Gears

The 15,585 fishers in Suba District operate about 4,910 boats, consisting of dug-out canoes, *sese* vessels and parachutes (*Jwenge*). The majority of these vessels are propelled by either oars or sails. Just a small fraction of them are motor-propelled, mostly with 15 HP engines. The fishery is dominated by nets with the beach seine being the most common and popular gear accounting for nearly 30% of the entire fishery, other notable nets includes gill nets and the monofilament nets. Hook and line is also dominant with the long line being more popular to the hand lines.

Status of Beach Seines in the study area

The survey carried out at Kaswanga and Utajo landing sites in Suba District revealed that the beach seine accounted for 65% of the entire fishery, long line 25%, gill nets 5% while small seines and monofilaments contributed 30%. The study also revealed that beach seine fishers tend to have close kinship ties further complicating attempts to curtail the gear as it is regarded as a family tradition.

Number of fishers involved

Kaswanga and Utajo beaches had 130 and 120 fishers, respectively, and each had 15-20 fishing crews. There were more crews with relatively small crew sizes (Figure 25), reflecting the easy accessibility to fishing gears and vessels. The fishery is considered lucrative hence a lot of investment has been put in, making Suba District one of the richest fishing areas in the Lake Victoria region.

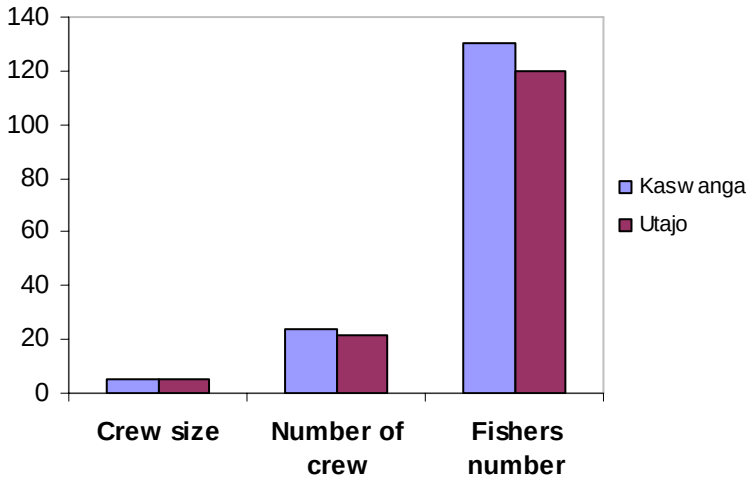

Figure 25. Number of fishers, crew number and size in Utajo and Kaswanga landing sites

Age class distribution

The majority of the beach seine crew members were in the age bracket of 30-49 years (Figure 26). The crew was largely selected based on experience in beach seine fishery, strength and age. This is because the fishery requires a lot of effort and hence the strength of the fishers is highly regarded.

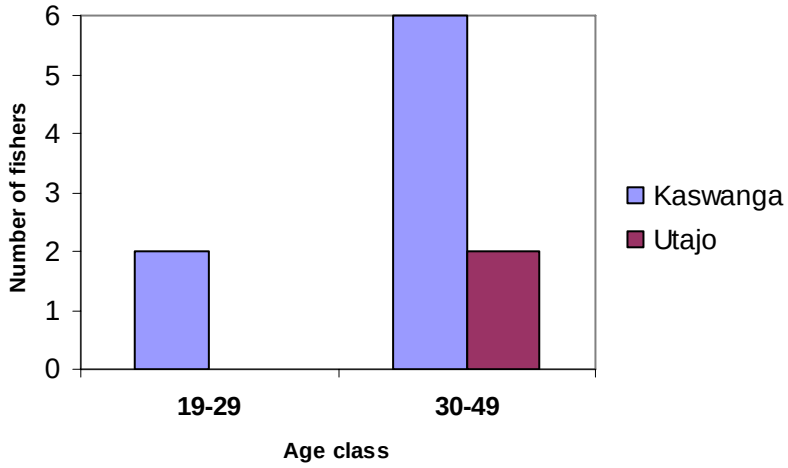

Figure 26. Age class distribution of beach seine fishers by landing site

Length of net and mesh size

The nets had varying mesh sizes consisting of floaters and sinkers with the characteristic cod end. The beach seine within Kaswanga and Utajo beaches varied from 300m to 600m in length (Figure 27) consisting of 3-4 pieces of joined nets. Most of the nets had mesh sizes varying from 2cm to 5cm. The mesh size was consistent at the forewings and the body but the cod end had finer mesh sizes of 2cm. Fishing is concentrated across the bay or suitable catchments area and the nets are then hauled up onto the beach.

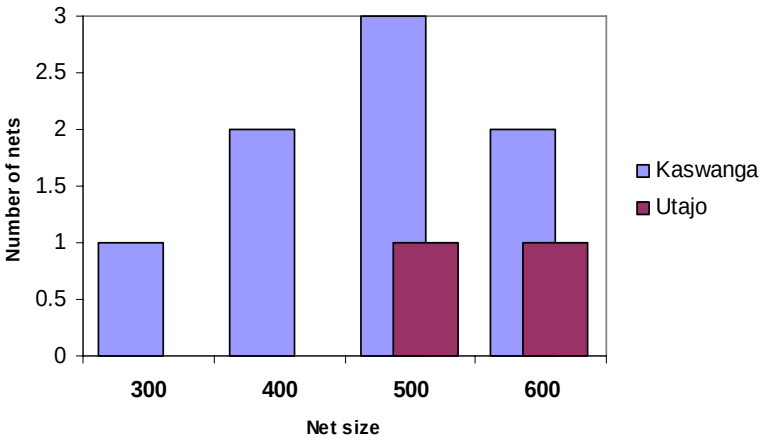

Figure 27. Common net sizes (m length) used at the landing sites

Modifications made by fishers

The fishers increased the length of the net by joining more nets and to increase the efficiency of the nets used a much smaller mesh size at the cod end. Larger crews had longer nets and more nets joined hence increasing the sweep of the net. In principle, an unmodified beach seine has a very small degree of selectivity due to the fine mesh sizes of this gear which results in indiscriminate capture of fish, hence raising great fear of depletion of such stocks in the Lake.

Catch composition, of beach seines

The maximum catch landed in a month by both beaches was 7,000 kg of fish with a minimum catch of 1,000kg and 200kg in a month for Kaswanga and Uajo, respectively (Figure 28). Nile perch dominated the beach seine landings contributing 75% of the catch (Figure 29)

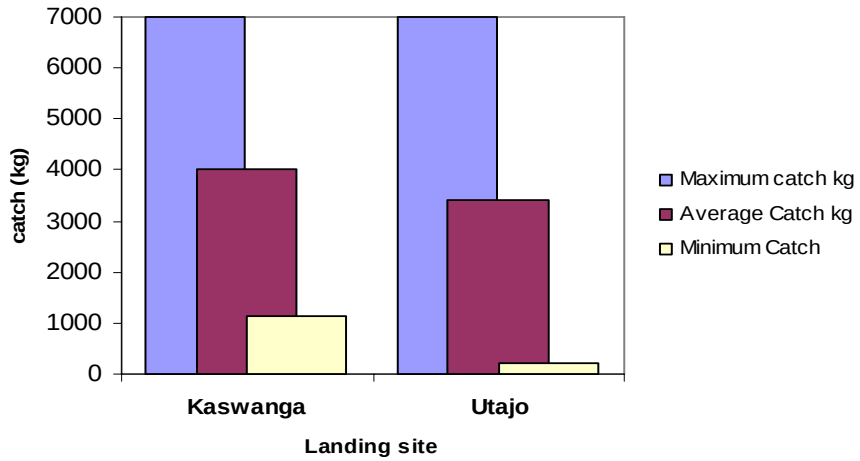

Figure 28. Maximum, average and minimum catch landed by beach seine crews

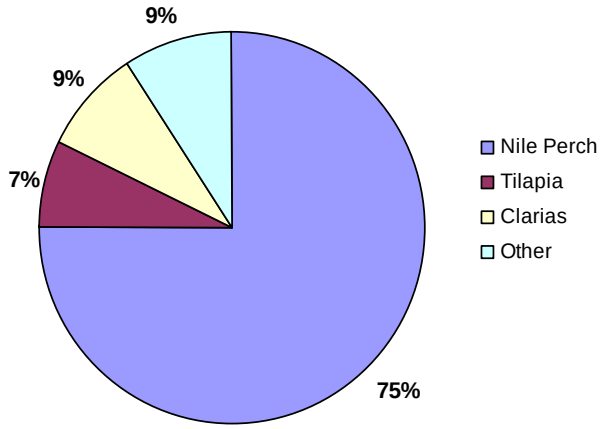

Figure 29. Catch composition of beach seine landings

By catch

Kaswanga and Utajo landing sites are beach seine dominated, the Nile perch therefore remains the target species. *Tilapia, Clarias* and *Haplochromines* are considered as by-catch by beach seine crews but are sold for local subsistence to the women traders, depending on their size. No fish has been observed being discarded. the national project coordinator said Levi Muhoozi, of the Implementation of Fisheries Management Plan (IFMP) recently stated that "the quantities of small fish (omena and *Haplochromines*) are increasing and contribute more than 1.5 million tonnes, about 75% of fish quantity in the lake." The beach seine is the primary gear used to catch these fishes.

Distribution of catch

Selling of fish directly to the processing factories was preferred but it varied from beach to beach depending on the catch composition. The disparity in the percentage of fish sold fresh between the two landing sites was due to the difference in catch composition with Kaswanga landing more Nile perch which is the preferred choice by the factories. In addition, it also reflects the percentage of fish that are within the slot size acceptable to the processing factories (Figure 30). On average the fishers got 2-2.5 kg of fish per day.

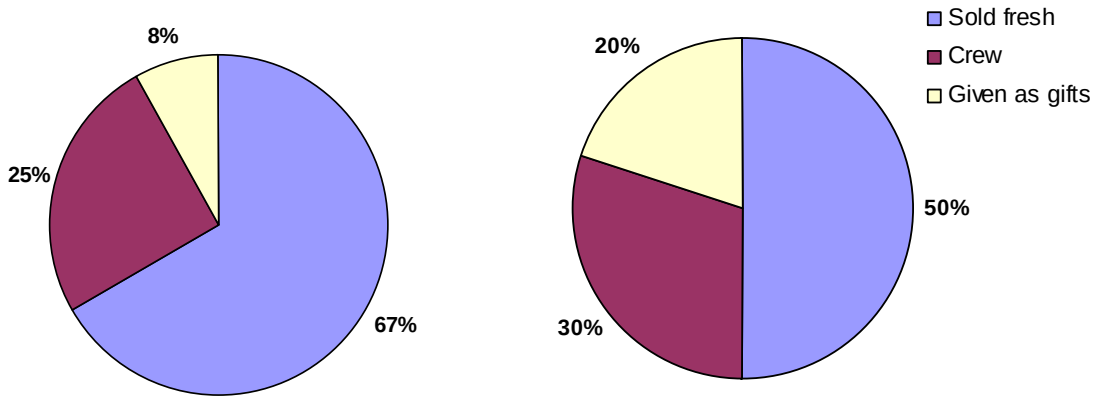

Figure 30. Left, Catch distribution in Kaswanga beach
Right, Utajo beach

Sorting of catch

The fish are sorted based on the species, quality and the slot size. The Council of Ministers adopted the slot size for Nile perch, allowing only fish between 50 and 80 cm to be caught and landed. This was geared towards curbing illegal fishing. Any fish below the slot size was not acceptable. Nile perch was highly preferred due to its commercial value hence given preference relative to its size and quality (Figure 31). The commercial factories have their agents at the landing sites that source for fish and pay on a cash basis with some fishers even being paid beforehand for the fish.

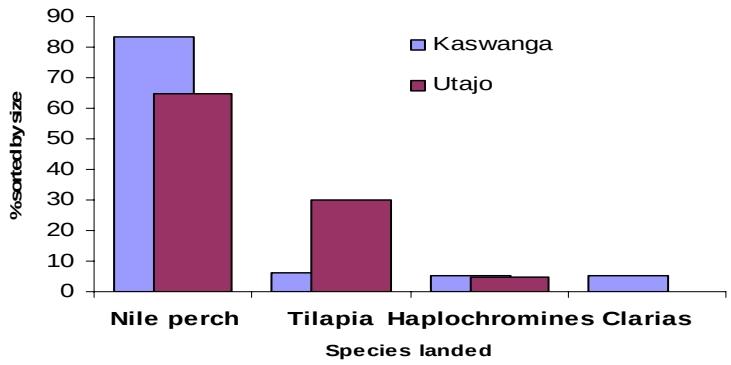

Figure 31. Percentage composition of fish sorted by size

Gear ownership

In most cases the net was owned by the captain in partnership with the family while the vessel was co-owned by the captain and the crew and in some cases by an investor (*tajiri*) (Figure 32). The engines were mostly owned by the *tajiri*, due to the initial high cost.

The fishery in Suba District is very rich and commercialised that most of the families have invested in the gears. The fact that there is ready market for the fish by the factories also plays a major role in the investment of fishery.

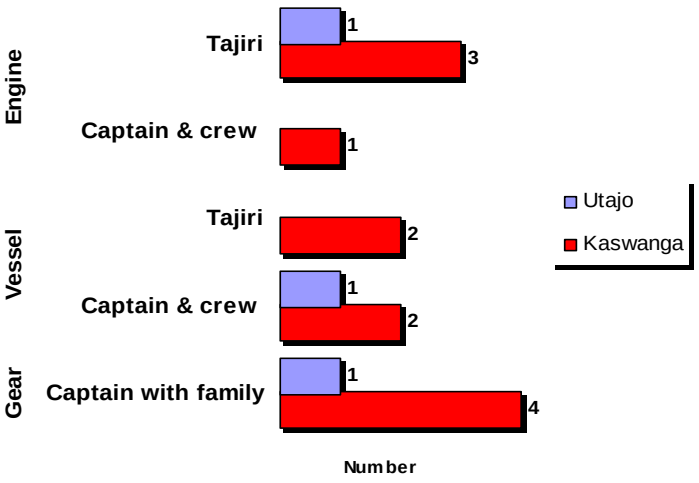

Figure 32. Patterns of gear and vessel ownership among landing sites

Initial and running costs for beach seine fishery

The initial cost of starting a beach seine fishery at Lake Victoria translates to Ksh 114,000, around USD 1,800 (Table 5), an amount that cannot usually be raised by an individual fisher. Other costs listed include ropes, floaters and sinkers. Most of the vessels are powered by sails but there are some that are powered by engine.

Table 5. Initial cost of beach seine fishery

Item	Initial Cost
Vessel	40,000
Nets	62,000
Other	12,000
Total	114,000

The running cost is calculated at Ksh 2,237 with the fuel taking the larger proportion of the cost; other running costs are subject to the prevailing conditions and are not consistent.

Gear supply, net making

Most of the fishers get their nets from local shops in Mbita town dealing in fishing equipments. Some of the nets are believed to have come from the neighbouring Tanzania.

Conflicts

Sharing of income and competition over fishing grounds were the major conflicts recorded (Figure 33). With so many fishing crews at the landing sites there is competition over fishing grounds between the beach seine fishers and other gear users, particularly the drift nets and the long line users.

The FiD has put administrative boundaries to the BMUs to minimise cross boundary conflicts. Beach seine fishers are in confict with fishers using long lines and bottom set nets in the same fishing grounds. The hauling of the nets is obstructed by the bottom set nets and long lines which entangle the beach seine nets leading to destruction of the nets and loss of fish.

The fishers on several cases disagreed with the *tajiri* over the sharing of income, this happens when the expected catch is not achieved. The sharing of the catch depends on the set daily target that the *tajiri* expects the crew to land. Based on this there are workable ratios that the crews are entitled to. Once the expenses accrued by the boat owner are deducted from the total sale of fish, the remaining amount is shared equally with the captain taking half and the crew sharing the other half. In cases where the set target is not achieved, there are usually cases of disagreement as the daily earning of the crew is affected.

The number of fishers and new entrants has continued to mount pressure on the already stretched fish stock thereby reducing the earning of the fishers due to increasing numbers of fishers. This also causes conflict over catch sharing. Most of the *tajiri* opt for shifts which also generates conflicts with some fishers preferring to fish daily instead of waiting for their shifts.

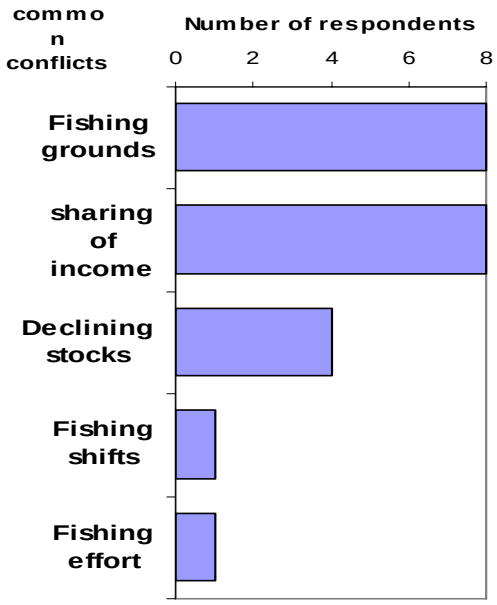

Figure 33. Common sources of conflicts

Enforcement and compliance of laws

All beach seine fishers interviewed were fully aware of the ban which was intensified in 2000 and 2001. Among the notable reasons given for the ban by the fishers include:

- Destruction of fish breeding grounds
- Catch juveniles and eggs.
- Has led to decline in fish stocks.
- Destroy habitats for fish.
- Led to reduction in income for fishers.

The enforcement by the FiD has been intense and this has led to a decline in the use of beach seine over the years. Lake Victoria fishers have responded to the enforcement measures by switching gears to long lines and gill nets. However, the real level of compliance is still low (Figure 34) with fishers known to hide their nets and catch under the water hyacinths during surveillance to conceal their activities.

Despite fishers in Lake Victoria having benefited much more that at the Coast from capacity building and empowerment processes for the BMUs, by-laws are mainly geared toward the resolution of conflicts that arise from the fishing activities and not towards ensuring that the ban on beach seines is respected.

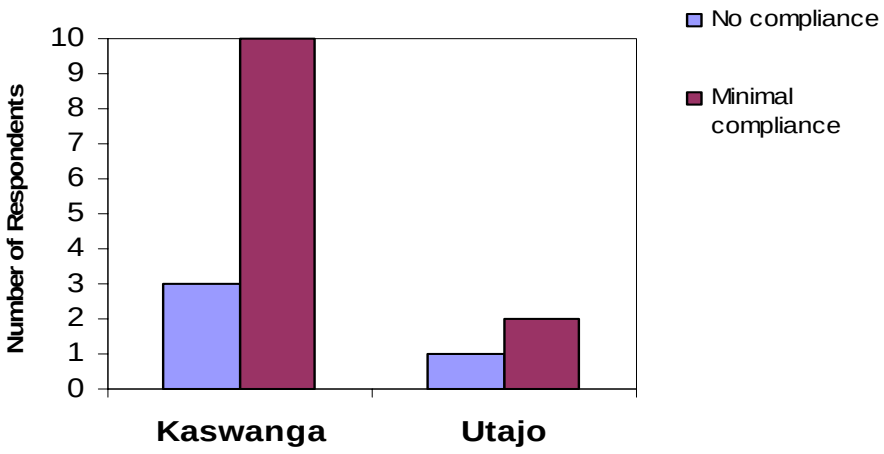

Figure 3Level of compliance to beach seine ban

5.6 Perceived impacts

The persistent use of beach seines in Lake Victoria is attributed to its high catch rate, being able to employ a large number of fishers employed, and the minimal input required to became a crew member.

Environmental impacts

With few exceptions, most fishers accepted that beach seining is destructive and is responsible for the capture of juveniles and the destruction of the fish habitats (Figure 35). They recognised that, being pulled along the shoreline, the gear in most cases interferes with nursery and spawning grounds.

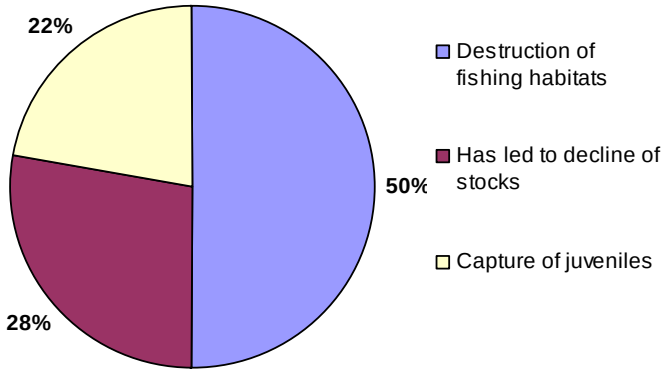

Figure 35. Perceived environmental reasons for the ban on beach seine

Social impacts

As found at the Coast, the main social impact is employment. In just two landing sites, beach seining directly employs just over 130 fishers with just over 2,300 dependants. Of these, 600 are directly or indirectly employed by the fishery either as fishers or traders at the landing sites. With the high number of fishers most of the captains and have opted for shift fishing so as to engage as many fishers as possible and to maximise profits.

Compared to the Coast it was observed that there were fewer women involved in the LV beach seine fishery.

Economic impacts

In Lake Victoria beach seining is highly regarded as the most economically lucrative gear due to the large catches of high quality Nile perch. In terms of catch, the beach seine landed up to 7 tons in a month while the minimum catch landed in a month was 940kg. The average catch per month was 4 tons. Hence as total catch the beach seine was regarded more productive compared to other gears. The individual return per fisher was also high with each fisher carrying home an average of 2.4 kg per day.

The low compliance of the ban is also influenced by the ready market offered by the processing factories. In fact very few factories are collaborating with the authoritires pushing the fishers towards respecting the minimum slot-size.

Most all fishers have confirmed that no trader so far has ever rejected any undersized Nile perch.

5.7 Proposed alternatives to beach seining

Respondents stated that they would prefer long lines and gill nets compared to beach seines, and if given the opportunity would like to engage in aquaculture (Figure 36).

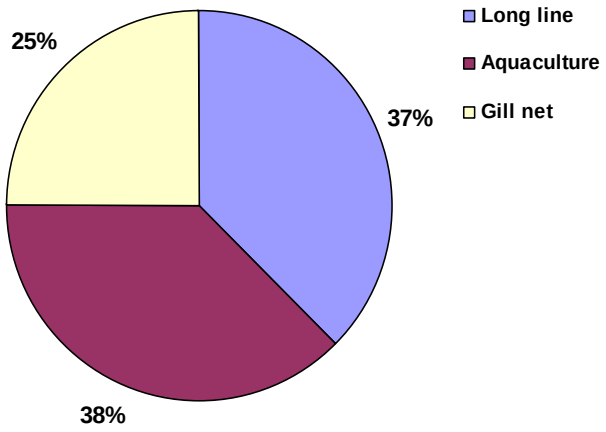

Figure 36. -Preferred fishing alternatives to beach seine

This has also been reflected in the increase in numbers of long lines and gill nets due to increased enforcement on the beach seine.

Among the alternative income generating activities, poultry farming was the most preferred, followed by crop farming and boat transport (Figure 37). Since most of these activities are already forming part of the fishers' secondary source of incomes, fishers have requested for any support to expand these activities which they prefer to the beach seine fishery but require higher investments.

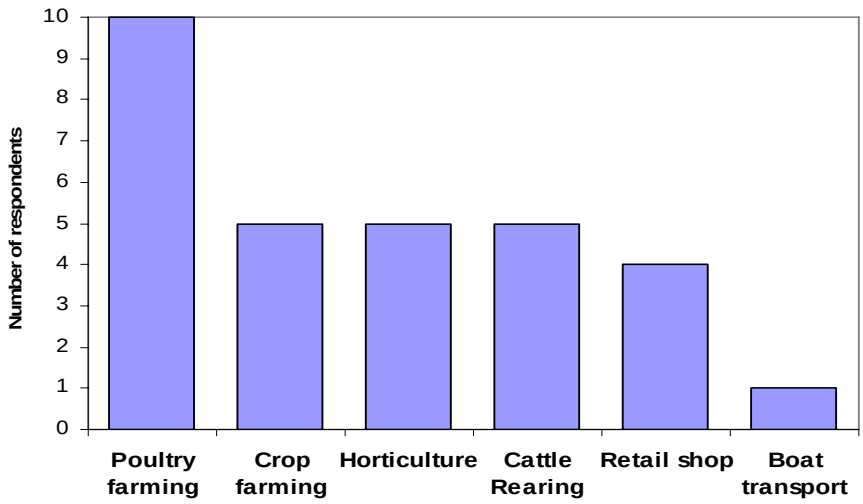

Figure 37. Non Fishing alternatives preferred to beach seines

6. MAJOR FINDINGS, DISCUSSION AND RECOMMENDATIONS

6.1 Coast and Lake Victoria comparisons

The field surveys carried out at the Coast and in Lake Victoria have highlighted several similarities as well as several differences among the marine and freshwater beach seine fisheries of Kenya. Here we present these similarities and differences, discuss the implications of the findings to fisheries management and propose recommendations for fisheries regulations regarding the beach seine fisheries.

6.1.1 Major similarities in the two locations

Perceived impacts

Fishers from both the Lake and the Coast were well aware of the negative impacts caused by beach seining operations. The most notable examples cited by both groups of fishers was the destruction of fish breeding ground habitats and the capture of juveniles. These were caused by the bottom dragging deployment method used to haule the nets, and the fine mesh, respectively.

The most important positive impact of beach seining in both locations was income generation and employment leading also to food security from the consumption of part of the catches. In fact the catch sharing arrangements ensured that most of the fishing community benefit from the beach seine fishery. In addition, in both locations, the role of youth and women, the first especially during beach seining operations, the second more in marketing and processing of the catches was found to be very important.

Awareness and compliance

In both locations, there was a high level of awareness regarding the ban on beach seining. However, despite this high level of awareness, the use of the beach seine has persisted in both locations, despite the ban and despite the level of enforcement, particularly at Lake Victoria. In fact beach seine use has increased over the last two years at the Coast. Compliance is clearly low, High showing that a high level of awareness may not lead to a high level of compliance. This suggests alternative approaches to managing this gear need to be sought.

Catch

In both locations an important finding from the field studies is the minimal existence of by-catch. No discarded fish were observed in either field survey.

Landing sites

The beach seine fishery is closely associated with specific landing sites in both locations. The conflict generated by beach seines with other gears particularly the set gears such as the basket traps, long line, and the set nets was high. Consequently beach seine fishers stated they would prefer their own landing sites or to fish at specific periods to reduce conflicts.

Historic characteristics

The beach seine is associated with specific communities - Tanzanian fishers were cited as the ones responsible for its introduction both at the Coast and in the Lake region.

Poverty

Both Coast and Lake Victoria fishing communities exhibit the highest levels of poverty in the country.

6.1.2 Major differences in the two locations

Investment

The first major difference among the two case studies is that the majority of fishers at the Coast were driven to the beach seine fishery due to a lack of alternatives, while fishers in Lake Victoria are attracted to the beach seine due to the rich Nile perch fishery associated with the gear and the ready market that is readily available for the landed fish. Since the fisheries sector is much more developed in the Lake due to the Nile perch fisheries, there are much more investment in the beach seine in LV compared to the Coast, as seen in the high number of nets and small crew sizes in comparison with fewer nets with large crews at the Coast.

Migrant/foreign fishers

Secondly, the majority of the beach seine owners in the coastal region are foreigners that employ local youth as crew. In Lake Victoria, the gear ownership is dominated by the locals with the crew coming from the neighbouring districts, though the crew often do not belong to the landing site and are not members of the BMUs. Local versus foreign gear owners is a crucial factor in terms of enforcements and compliance. Locals can have some attachment to their own fishing grounds as well as an interest towards conserving it, whereas migrating fishers especially if foreigners (such as the *Wapemba* in South Coast), are likely to be more opportunistic with short term objectives.

Compliance

There has been marked decrease (90%) in the number of beach seines in the Lake Victoria region in recent years, whereas the nuber of beach seines at the Coast has increased. The decline at LV has been attributed to the increased and concerted surveillance and awareness by the Fisheries Department in collaboration with the fishing communities who have realised the negative impacts associated with the gear. Patrolling and MCS activities have also been accompanied by awareness creation and sensitisation activities to minimise risk of conflicts. In contrast. very little awareness, sensitisation and cooperative enforcement has occurred at the Coast. In addition, the involvement of the fishers in comparing the catch rates of beach seines and the long line in Suba has led to an increase in long lines and a decline in the beach seine.

Catches

The data from the FiD frame survey from LV show a decline in catch landed in the last 6 years corresponding with the significant reduction in number of beach seines. The Nile perch fishery has experienced lower catches and smaller catch sizes that are indicative of the amount that the beach seine used to contribute to the overall catch landed in Lake Victoria.

The presence of juveniles was reported to be notable only during specific periods in Lake Victoria, and only for a few species, unlike the Coast where the presence of juveniles from many species was reported throughout the year.

Conflict

There is apparently less conflict in LV due to the greater sensitisation, awareness and participatory management between fishers and FiD. In contrast at the Coast the patchy enforcement activities have been perceived by the coastal communities more negatively. All communities have seen the beach seining ban as an action that will have a very negative impact on the livelihoods of the fishing communities leading to further decline in poverty levels. However, the coastal beach seine fishers interviewed felt victimised due to the constant confiscation of their gears without providing alternatives. They stressedthe need for consultation in major decisions touching on their livelihoods. They would have preferred softer alternatives rather than imposing a complete and unenforceable ban. Lake Victoria fishers had a greater understanding and were more involved in the enforcement process with FiD.

Capacity building

Through the capacity building programme of IFMP, all BMUs along the Lake have been properly trained and empowered, and are now able to operate as co-management bodies to ensure the appropriate local control on fishing activities and compliance within national regulations and by-laws. This has not been done at the Coast.

Legal aspects

Coastal marine waters fall exclusively under Kenyan laws, whereas the legal management of the Kenyan waters of Lake Victoria is strictly linked and subordinated to the direction provided by the LVFO council of ministers. In a harmonised legal and policy framework at regional level, any change in the national legislation will influence the delicate equilibrium among the three countries.

In the light of this regional aspect in the Lake, the option of lifting the ban of beach seining is difficult legally and probably not advisable in the LV waters. Moreover,the lift is not advisable since the effects of lifting the ban after seven years of almost continuous enforcement will create great confusion among fishing communities. It would also generate cross boundary issues whereby an influx of beach seiners from Tanzania and Uganda into Kenyan waters would be likely.

6.2 Recommendations

Within the scope of the present study it was not possible to measure the total number of households involved in beach seining, but for the Coast the total number of fishers was estimated to be anywhere between 11,000 and 18,000 involved in beach seining, of a total 65,000 artisanal fishers. At Lake Victoria there are 15,585 fishers in Suba District where the field study was done, of which around 30% use beach seines. This gives 4,676 beach seine fishers in one District only. This District accounts for around 51% of beach seine fishers in the Lake, therefore a total of around 9,400 beach seine fishers may be operating in Lake Victoria (Kenyan waters). Dependency on this gear extends further if the following figures are used: 186,336 people are enumerated to depend on fishing and fishery related activities for their livelihood in Suba District. Using the rough calculation of 30% are beach seine related, this gives an overall figure of 112,000 for the whole Lake. Thus in total, in Kenya, probably around 20,000 fishers are using beach seines, and at least a further 200,000 people may be dependent on this gear for their food and livelihoods. It is within this social context, and within the context of a ban that has proved very difficult to enforce at the Coast, and also difficult to fully enforce at the Lake, that the following recommendations are made.

Although there are similarities between the marine and freshwater beach seine fisheries in Kenya, the differences outweigh them and therefore several management recommendations are specific to each fishery. Recommendations are thus split into three groups: (i) specific measures proposed for the Coast; (ii) specific measures proposed for Lake Victoria; and (iii) overall recommendations valid in both locations.

The following management recommendations are proposed as temporary measures for the immediate term to address the difficulties in enforcement of the ban on beach seines in Kenya. They are put forward for discussion and consultation, particularly with the policy and management agency (FiD) and also the fishers themselves. We propose an iterative approach whereby options are put forward by different stakeholders and are then discussed and consensus reached on the most appropriate way forward (sensu Martin-Smith et al. 2004).

6.2.1 Recommendations for the Coast

Within the framework of the revision processes of the new Fisheries Policy and the Act, it is recommended that decision makers consider the option of a temporary lifting of the ban on beach

seines at the Coast for a five year period during which the following management measures are introduced to effect a slow phase out of beach seines:

1. Introduction of a minimum 4 month closed season (October-January) for beach seines, articulated in the by-laws in all BMUs;
2. Establishment of "no beach seining areas" to protect the most sensitive habitats of the fishing grounds, articulated in BMU by-laws, and, where relevant, in concordance with KWS legislation;
3. Possible introduction of temporary beach seine net modifications involving limits on length, height and mesh size to be discussed with fishers;
4. Existing beach seine users are given special temporary licenses licensed under BMU/District level management to operate within the above restrictions;
5. Co-management mechanisms adopted through BMU by-laws and others to effect these temporary measures;
6. The impacts of the proposed management measures are monitored and evaluated yearly, in collaboration with local fishers through BMU structures.

The reasons for these recommendations are as follows. The field study shows clearly that the ban on beach seining is very difficult to enforce, and coastal fishers are in fact increasingly entering the illegal beach seine fishery despite the ban on this gear. Clearly the prohibition is not working. The study goes on to show that this is because such a large portion of fishers are now dependent on this gear for their livelihoods, particularly the youth, and also women through catch processing, largely due to poverty and few other livelihood options.

Despite the recent introduction of the BMU system, the coastal artisanal fisheries in Kenya are still poorly managed. Lack of capacity and acces to technical and financial resources are reported to be the major bottlenecks for the effective implementation of the new co-management system and sustainable fisheries management. Without the support required, as provided to the BMUs of Lake Victoria, coastal BMUs will struggle to gain the skills and experience needed to develop by-laws, enforce any legislation, regulate fishing and preserve their marine resources.

More commitment to BMU empowerment and capacity building and special attention to the post-harvesting and marketing sector is urgently required. For the Regulations to be complied with and enforced in a cost effective manner, a co-management system based on strong and well trained BMUs is needed. In addition, a stable market and good market access supported by well distributed infrastructures are required for livelihood development, as well as the introduction of alternative livelihoods.

Specific issues that inform the management measures proposed are as follows:

<u>Enforcement of beach seine ban</u>

Due to the current socio-economic situation in coastal communities in Kenya, other approaches to enforcement of the ban need to be considered. We propose a softer approach designed to bring the ban on the gear into full effect over a five year period. Thus the current total ban would be temporarily lifted for this period while partial closures are introduced to gradually bring beach seine fishers into compliance. Closing would start slowly through temporal (seasonal) and spatial (area) closures that target the high incidence of juvenile capture and sensitive habitats, while alternative livelihood options for these fishers are developed. Gear modification may also assist in reducing the damaging impacts of beach seines.

<u>Seasonal closures</u>

Seasonal closure options are already enshrined in the Fisheries Act and therefore the legislative framework is in place for this measure. Gazi BMU has already imposed a seasonal closure on the beach seine fishers during the NEM to minimise conflict with other gears.

Spatial closures

Spatial closure options are already enshrined in the Fisheries Act and therefore the legislative framework is in place for this measure. Consultation with fishers will help identify known spawning or nursery sites and sensitive habitats that could be set aside.

Fishery sustainability

Empirical studies have shown that the artisanal fishery CPUE in areas where beach seines operate is significantly lower than where they do not operate (McClanahan et al. 1997, McClanahan and Mangi 2001). Fishers, resource users and managers were unanimous in their perceptions that beach seines are an unsustainable fishing gear for Kenya's coastal reef fishery. It is therefore recommended that the Regulation of banning this gear be maintained, but that its full enforcement be imposed in a step wise phased approach over five years, while other alternatives available for these fishers are also sought.

Gear modification

Several countries (e.g Benin) have introduced beach seine gear restrictions to minimise capture of juveniles and damage to the benthic habitat, such as a minimum mesh size, minimum length of the cod end and minimum maximum total length. Others use floating beach seines (e.g. Australia). However, these are largely fisheries that operate in soft bottom, sand/silt habitats where the environmental impacts of beach seines are much less. On Kenya's coast the beach seine fishery operates in the seagrass and patchy coralline habitat of the reef lagoon, an area that is highly sensitive to damage from bottom hauled nets, and where a high diversity of fish species occur, several of which have low value in reef fisheries. Gear modification may not therefore be as effective. Nevertheless this option should be considered if it were to assist fishers in slowly phasing out from the fishery.

Fisher conflict

When conflicts exist between artisanal fishers, as is the case in Kenya, it is likely to be more effective to side with those gears that are perceived to be more traditional such as basket traps, handlines and gill nets (McClanahan and Mangi 2004). Traditional fishers, other resource users and managers at the Coast perceive the non-traditional beach seines to be an unsustainable gear and responsible for much of the overfishing in Kenya's reef lagoon fisheries (McClanahan et al. 2005, McClanahan 2007). Despite this, large numbers of fishers still use the prohibited gear illustrating high dependence and very few other options.

Co-management

The proposed phase-out should be conducted in close collaboration with fishers using the institutional framework of the BMU Regulations. This will ensure monitoring and enforcement are participatory, and will give fishers responsibility for the management of their resources, including the imposition of fines/confiscating gears.

The co-management approach has the following advantages:

1. Optimal cost effectiveness in enforcement efforts
2. Increased participation and sense of ownership of the Regulations by the fishing communities
3. Acceleration of the process of legal recognition of the BMUs by the broader community
4. Financial sustainability of local MCS if a fining system at BMU level is invoked

6.2.2 Recommendation for Lake Victoria

The regional legal framework and the level of investment and infrastructures related to the fisheries sector in Lake Victoria does not allow any foreseeable lift of the current ban on beach seines. However, it is clear that enforcement alone does not represent the best solution. The recommendations below are considered as necessary complementary actions to the ongoing enforcement activities:

1. A full assessment of previous gear exchange programmes and pilot experimental comparison of catches from hooks and lines vs. beach seines to recommend a future gear exchange programme;
2. Discourage the market of catches derived from beach seining: strong controls of slot size at buyer level; introducing fines and legal actions against who buys/sells/processing undersized Nile perch; persecuting traders and processors and not only fishermen;
3. Complete the demarcation of the spatial closures that have identified the main breeding grounds so that they can be managed and monitored through the BMU structures;
4. Actively involve NGOs, BMUs leaders in patrolling actions to ensure broader participation and mutual involvement in MCS.
5. that a cost benefit analysis shall be undertaken by the FiD to estimate the cost implications and the feasibility of a total and continuous enforcement of the ban in Lake Victoria and share the results at the LVFO level to identify alternative enforcement options and more economical MCS arrangements.

6.2.3 Overall recommendation at national level

The lack of compliance and difficulties in enforcement of the ban on beach seines as presented in this report, suggest that the introduction of alternative measures that will complement enforcement activities are urgently needed.

Five overall recommendations are proposed:

1. Initiate poverty reduction and alternative employment generation initiatives to minimise the economic incentive to return to beach seining: livelihood diversification activities are essential.

2. Introduce co-management complementary measures and develop them as by-laws enforced locally by co-management structures such as the BMUs to strengthen compliance.

3. Coordinate and link between Governmental and UN/NGOs' education, awareness and training programmes for fishers in co-management approaches and fisheries sustainability, in tandem with enforcement efforts.

4. Foster collaboration among Government, NGOs and financial institutions to enable fishers to access credit and microfinance services for the purchase of legal fishing gears.

5. Empower fishing communities to participate at the policy level in the formulation of fisheries and resource use regulations. This will have the dual benefits of incorporating their knowledge into the system, and reducing confusion and misunderstandings when it comes to implementation.

The high dependence on beach seining for income and food reflects the fact that the highest poverty levels in the country are at the Coast and at Lake Victoria (61%-62%, national poverty statistics, 2000), because there are few other livelihood options (Samoilys and Kanyange 2008). The first recommendation is therefore crucial but difficult because it addresses the much broader issue of poverty alleviation in Kenya. It is highly recommended that specific livelihood studies aimed at identifying the most suitable livelihood diversification options for fishing communities evaluate previous studies in Kenya and neighbouring countries (Ireland et al. 2004, Harrison 2005, Signa 2007, Wells et al 2007, Samoilys and Kanyange 2008, Mirera and Samoilys in press), conduct a location specific livelihood assessment, and prepare a detailed proposed programme of intervention for the Kenyan Government, to be initiated on a trial basis, with the impacts closely monitored and evaluated. It is recommended that any livelihood support activity must primarily target youth and women because of their important role in beach seining, at least at the Coast. FiD is in a position to specifically examine and encourage aquaculture as a viable alternative livelihood for fishers.

6.2.4 Final Considerations

While it is clear that the beach seine gear is very important to the communities in terms of food security, income and employment, it is also clear that as currently practiced the beach seine compromises sustainability in the exploitation of fisheries resources. Consequently, the dilemma policy makers and management institutions face is to balance peoples' needs with the need to ensure a healthy and functioning ecosystem that can maintain fisheries productivity for generations. This can be done only if we first understand deeply the livelihood challenges and opportunities faced by local fishing communities with an open minded and participatory approach. As shown by the reluctance of fishers to accept the 2001 ban and the difficulties faced by the enforcers, understanding the socio-cultural aspects of these fisheries is crucial to ensure the success of sustainable fisheries management measures. If small scale fisheries are to be made sustainable, the wider enabling environment which is currently undermining fishing livelihoods needs to be understood and strengthened.

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11. UNDP sustainable livelihoods webpages: www.undp.org/sl
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13. Western Indian Ocean Science Association website: www.wiomsa.org

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Various BMU leaders, members and other stakeholders			

Annex 3 Images

Plate 1-Interviewing Gazi beach seine fishers

Plate 2 Interviewing Beach seine fishers at Marina landing site

Plate 3 -Beach seine landing catch at reef landing site

Plate 4 -Beach seining in progress at Nyali landing site

Plate 5-Dug out canoe releasing the beach seine at reef landing site

Plate 6 -Beach seine in progress at Nyali landing site

Plate 7-Logo denoting Nyali landing site

(Photo credits: Paul Tuda)

Plate 8. Beach seining at Mtwapa, north of Mombasa, 2007

Plate 9. Hauling the beach seine at Mtwapa, north of Mombasa, 2007

(Photo credits: Melita Samoilys)

Plate 10. Beach seining at Nyali Beach

Plate 11. Exceptionally good catch of a school of *Kole Kole* (Trevally) in Nyali

Plate 12. Catch sharing among crew members in Nyali (note the small pelagics)

Plate 13. Net mending in North Coast

Plate 14. Young woman selling fried fish in a local market in Ukunda- Kwale

Plate 15. Woman in the mangroves cleaning small fish for frying - Gazi

(Photo credits: Davide Signa)

Plate 16. Fishers removing a beach seine previously hidden under the water when they spot enforcers in LV

Plate 17. Part of the over 120 beach seines confiscated from the waters over the 36 hours operation in Suba

Plate 18. Burning the confiscated beach seines at Mbita in Suba District

(Photo credits: Fisheries Department Kisumu)

Annex 4. Field Checklist and Questionnaire form

NATIONAL BEACH SEINING STUDY

FIELD GUIDE CHECKLIST FOR FIELD OPERATORS/ DATA COLLECTORS

Date: …… Location: ……

Operators names : ……

1. At arrival on each site:

☐ Meet the DC in an agreed meeting point before entering in the village

☐ Take the GPS coordinates of the visited site;

☐ Look for the BMU leaders and village Elders/Leaders and ask for a quite private place to meet;

3. Introductory meeting with the BMU leaders (max 8 Participants) Supervisor- Data Collector

☐ Introduce yourself (preferably with some joke to warm the atmosphere)

☐ Do a roundtable of introduction asking to specify the title and the role of the institution representing of all participants

☐ Explain the purpose of the visit stressing the point that you are not there to control or enforce any law at all but just to LEARN

☐ DON'T raise any expectation and be ready to answer and accommodate any disappointment without any promise of follow up for the moment since we will just write a report that CAN or CANNOT have some follow up.

☐ Show the proposed daily schedule and ask for approval on the time for the meetings

☐ Read and agree with data collector and BMU leaders on the selection criteria of the people to be invited to the group discussions

☐ Agree the venue for the meeting preferably with chairs and in the shadow and reconfirm the time schedule

☐ Ask the permission to have a brief walk around the landing site and to take some photo and ask for 1 or maximum 2 persons to accompany

☐ In case of overnight ask for possibility of accommodation and make lunch and dinner arrangement.

4. Landing site visit:

☐ First ask the accompaniers to draw a draft map of the landing site area and mark the place in the map where beach seine is operated and take the GPS coordinate of the beach seine area;

☐ Walk slowly and take always all the time for questions, pictures and chatting with people met

- ☐ Don't limit to a straight line and walk randomly but passing by high point to have an overview
- ☐ Focus on the recent changes on the fisheries aspects and the landing site itself, ask the observers to note what changes from 1 -5 and 10 years ago
- ☐ Look at kind quality weight and diversification of the catches especially by beach seining
- ☐ Draw in details the kind of beach seine used with measurement and mesh size
- ☐ Count fisher boats and gears, type and conditions
- ☐ Take note of all the relevant answers and main issues discussed.

5. Focus Group Discussions (max 15 Pax) DATA COLLECTOR (FS to backstop and take notes)

5.1 Intro (max 20 min)

- ☐ Ask leader/elder to give a brief intro speech of max 5 min
- ☐ Introduce yourself and Paul (preferably with some joke to warm the atmosphere)
- ☐ Explain what is CORDIO, what does and the main approach
- ☐ Explain the purpose of the visit and the objective of the study
- ☐ Do a roundtable of introduction asking to specify of all participants
- ☐ Explain the purpose of the visit stressing the point that you are not there to control or enforce any law at all but just to LEARN
- ☐ DON'T RAISE any expectation and be ready to answer and accommodate any disappointment without any promise of follow up for the moment since we will just write a report that CAN or CANNOT have some follow up.
- ☐ Request to participants to introduce themselves publicly with a roundtable of introduction asking to just briefly mention name age and occupation;
- ☐ Check carefully that participants have been selected in line with selection criteria!!
- ☐ Explain the programme and structure of the meeting
- ☐ Mention the ground rules (time keeping, not interrupting the others, allow women to talk freely if they want, avoid irrelevant questions)
- ☐ Ask if there are some preliminary brief question (don't accept irrelevant questions)

5.2 Discussion

- ☐ Brainstorm brief discussion on the main livelihood/ and fishing activities in the village and RELATED problems. (Keep the discussion very focused and brief. It serve mainly to warm up)
- ☐ **Stones exercise 1:**

Question: IF THIS 10 STONES ARE YOUR ENTIRE FISHING ACTIVITIES IN A YEAR, HOW MANY IS THEM REPRESENTING BEACH SEINING? AND THE OTHER FISHING METHODS?

Let a volunteer to start. Take note

Ask who is not in agreement to change. Ask why

Ask others to comment, let them discuss for max 3-5 min and record the final agreed sizes.

☐ **Stones exercise 2:**

Question: IF THIS 10 STONES IS YOUR ENTIRE INCOME GENERATION IN A YEAR HOW MANY STONES YOU NEED TO REPRESENT YOUR INCOME FROM BEACH SEINING?AND FROM THE OTHERS TYPE OF FISHIERIES AND OTHER ACTIVITIES?

Let a volunteer to start. Take note

Ask who is not in agreement to change. Ask why

Ask others to comment, let them discuss for max 3-5 min and record the final agreed size.

☐ **Stone exercise 3: (THIS COULD BE USED BETTER IN THE KI HOUSEHOLD INTERVIEW)**

Question IF THIS 10 STONES IS YOUR ENTIRE FOOD SELF-PRODUCTION IN A YEAR HOW MANY STONES YOU NEED TO REPRESENT THE CONTRIBUTION OF BEACH SEINING ON YOUR HOUSEHOLD FOOD SECURITY?

AND FROM THE OTHERS TYPE OF FISHIERIES AND OTHER ACTIVITIES?

Let a volunteer to start. Take note

Ask who is not in agreement to change. Ask why.

Ask others to comment, let them discuss for max 3-5 min and record the final agreed size.

5.3 Semi structured Questionnaires for FDG

5.3.1 Questionnaire Form 1 for first meeting with NON beach seiners fisherfolks and other stakeholders (make sure there are NOT beach seiners people in the group)

Objective: To understand from outsiders perspective the impact, importance and conflict generation of beach seining

A. General Info

Questionnaire No:…… Date:……

Location:……

1. Respondents Names:…….. Sex:.....

   Group size:……

2. Age: <18……19-29 ……..30-49…… >50……..

   Occupations:

Fishermen…… Fish MongersTraders…….. Boat operators……

Mama caranga…… Bach boys…… Others:(specify)……

B. Beach seining Activities

3. How many beach seining crews operate in the landing site?.....

4. How many fishers in each crew?.....

5. List their age brackets <18….. 19-29….. 30-49….. >50…..

6. How is the crew selected?.....
   ……
   ……

7. What is the size of the net used by the crews? Length…….Mesh size…….

   a. Number of joined nets…….

8. During which season is the use of beach seine prevalent?
   SE Monsoon.....NE Monsoon.....

   Reason
   ….....……...
   ……

10. What are the common fish landed by beach seine, their approximate proportion and which ones are preferred fish or by catch? .....
    ……..……
    …..……

17. Do beach seines catch more or less fish than other gears? As a total ……. Per fisherm……
    ……

18. What are the modifications included in a beach seine net to improve its efficiency? Elaborate……
    ……
    ……..
    ……
    ……

D. Conflicts and Compliance

23. Are there any conflicts arising from Beach seine use in this area? Yes..... No……

    List the conflicts.....
    ……
    ……
    ……
    ……

    What is the main cause of these conflicts?.....
    ……
    ……
    ……

    a. What action has been taken to address these conflicts and by who?

……
……
……

Are there rules and regulations related to beach seine fishing? Yes……No……
Explain……
……
……

a. On a scale of 1 to 4 (1=no compliance, 2=Minimal compliance, 3=Compliant, 4=full compliance), to what extent do people comply with rules and regulations? ……

24. Are you aware of the beach seine ban? Yes……...No……

a. If yes, when was the beach seine banned?
……

b. Why was the gear banned?.....
……
……

c. How have the fishers coped with the ban?
……
……
……

25. Do you consider beach seining a destructive fishing gear?
Yes…….No……..
Why?
Elaborate:……
……
……
……
……

26. If yes, would you accept a modification on your beach seine that reduces the destructive impact?
……
……

27. Why has the use of beach seines continued? Elaborate……

……

……

28. Is the number of beach seine crews increasing or decreasing? Explain why……
……
……

29. What determines your choice for gear you presently use?.....
……
……
……

30. When you think about direct benefits to fishermen, rank common fishing gears:…….....
……

……
……

31. What other income sources do beach seine fishers have. Rank them in order of importance, and note any details such as different seasons to note if they conflict or not with fishing activity.

……

……

……

32. When you think about the household wealth of fishermen, rank the common fishing gears:

……

If 28 and 30 are different, explain why (e.g. other sources, age, etc)……..……

……..……

……..……

33. Suggest some viable alternatives to beach seine. What would YOU prefer to doing that which is viable?
    a. For fishing……..……
    ……..……
    ……..……
    b. Other options(alternative livelihoods)……..……..……
    ……..
    ……..……
    ……..……
    ……..……

END OF THE QUESTIONNAIRE, THANKS

5.3.2 Questionnaire Form 2 for first meeting with ONLY beach seiners (make sure there are ONLY beach seiners people in the group)

Objectives: To understand from insiders perspective the modalities, ownership, impact, importance and conflict generation of beach seining

A. General Info

Questionnaire No:…… **Date:…….**

Location:…….

1. Respondents Names:…….. Sex:.....

Group size:……

2. Age: <18……19-29 ……..30-49…… >50……..

B. Beach seining Activities

3. How many beach seining crews operate in the landing site?.....

4. How many fishers in each crew?.....

5. List their age brackets <18….. 19-29….. 30-49….. >50…..

6. How is the crew selected?.....
   ……..……
   ……..……

7. What is the size of the net used by the crews? Length……Mesh size……..…….
   a. Number of joined nets…….

8. During which season is the use of beach seine prevalent?
   SE Monsoon.....NE Monsoon.....
   Reason……
   ……..

9. Ownership of the gear: How many people own the boat/engine/gear?

Boat - Owned by: captain only/captain and crew/captain partnership with family/tajiri/other……..
Engine - Owned by: captain only/captain and crew/captain partnership with family/tajiri/other……..
Gear - Owned by: captain only/captain and crew/captain partnership with family/tajiri/other……..

10. What are the common fish landed by beach seine, their approximate proportion and which ones are preferred fish or by catch?

    .....

    ……..

    ……..

11. What is the average catch obtained by standard beach seines from this area? Specify how many fishers, and how many days a month this catch is obtained.

.....……
.....……

   b. What is the maximum catch obtained? How often (days per month? ……
   c. What is the minimum catch obtained? How often (days per month? …….

12. How is the total catch distributed after landing?……..……
    ……..……..
    ……..……..

   d. What is the percentage/amount of catch
      Sold fresh……..
      Crew ……
      Given as gifts……

13. What criteria are used to sort the landed fish (size, spp etc) ……....

    ……..

    ……..

   e. What is the percentage/amount each of the groups based on size?.....
   f. What other species are caught in seine nets but are not landed (the percentage/amount of discards)……

    ……...

14. How is the by catch utilized?.....
15. How is the by catch processed before sale?.....
16. Who do you sell your fish to? Give an elaborate response)(Beach seiners/fish traders)

    Fish trader……

    Market……..

Hotels ……..

a. Do you process your fish before sale? Explain…….....
……..

b. How much fish do you take home (in kg, per fisher?).....

c. For fish traders, how much of their sale is from beach seines compared to other gear?
……..

d. How is beach seine efficiency rated against other gears?.....
……
……

17. Do beach seines catch more or less fish than other gears? As a total ……. Per fisherman …..
……
……

18. What are the modifications included in a beach seine net to improve its efficiency?
Elaborate……
……
……

C. Cost of Fishing-Beach seine Owners

(ALL THESE QUESTION MUST BE REPEATED TO A BEACHSEINE OWNER DURING A INDIVIDUAL INTERVIEW TO COMPARE RESULTS)

19. What is the initial cost of investment for beach seine fishing? Specify net/boat/engine size.
Vessels……..
Nets……...
Others……

20. What are the running costs for beach seine fishing (per day) Kshs?
Transport……..
Accommodation……..
Boat repairs…….
Fuel costs……
Net repairs …….
Others ……

21. Who is/are the main supplier of the beach seine? …….

g. What other gears are used with/ are dependent on beach seine fishing?.....
.....

h. What other activities are dependent on beach seine fisheries?.....
……

22. Does Beach seining avail jobs to your community? Yes……No.....

i. If yes, what kind of jobs.....
.....
.....

j. Number of fishers/employees from this landing site, and how many dependents on average (if known).....

D. Conflicts and Compliance (SAME QUESTION THAN IN FDG1 TO MAKE A CLEAR COMPARISON BEETWEEN INSIDERS AND OUTSIDERS POINTS OF VIEWS)

23. Are there any conflicts arising from Beach seine use in this area?
    Yes..... No…….

    List the conflicts.....
    ……...
    ……...
    ……...

    b. What is the main cause of these conflicts?.....
    ……...
    ……
    c. What action has been taken to address these conflicts and by who?
    ……

    ……

    ……

24. Are there rules and regulations related to beach seine fishing? Yes…… No……
    Explain……
    ……
    ……

    k. On a scale of 1 to 4 (1=no compliance, 2=Minimal compliance, 3=Compliant, 4=full compliance), to what extent do people comply with rules and regulations? ……

25. Are you aware of the beach seine ban? Yes……...No…….

    d. If yes, when was the beach seine banned? ……..

    e. Why was the gear banned?.....

    ……

    ……

    f. How have the fishers coped with the ban? ……..
    ……..
    .....……..

26. Do you consider beach seining a destructive fishing gear? Yes…….No……
    Elaborate……..……..
    ……
27. If yes, would you accept a modification on your beach seine that reduces the destructive impact?
    ……....
    ……
28. Why has the use of beach seines continued? Elaborate…….....

    ……

    ……
29. Is the number of beach seine crews increasing or decreasing? Explain why……
    ……..
    ……

30. What determines your choice for gear you presently use?.....
    ……
    ……

31. When you think about direct benefits to fishermen, rank common fishing gears:

    ……..

32. What other income sources do beach seine fishers have. Rank them in order of importance, and note any details such as different seasons to note if they conflict or not with fishing activity.

    ……..

    ……..

    ……..

    ……..

33. When you think about the household wealth of fishermen, rank the common fishing gears:

    ……..

    If 28 and 30 are different, explain why (e.g. other sources, age, etc)…

    ……..

    ……..

34. Suggest some viable alternatives to beach seine. What would YOU prefer to doing that which is viable?
    l. For fishing……..
    ……..
    ……..
    m. Other options……
    ……..
    ……..
    ……..

5.4 FDG MEETING Wrap up:

☐ Make a brief summary of your understanding of the main issues arisen during the questionnaire.

☐ REOPEN the conclusion:

Have I got all correctly? ……
Have I missed some part?..……..
Is there something else to be mentioned……

☐ Ask for final question or brief comments only if are RELEVANT;

☐ Conclude thanking all and remarking again that no activity will start because this is a study and not a project PLEASE RE-REDUCES ANY EXPECTATION BEFORE CLOSING THE MEETING.

☐ Take a few final photos of the group meeting before releasing the group.

☐ Paul to identify the more active and participating people in the FDS and the DC to call them apart at the end of the meeting to ask in they would accept to be interviewed individually at their own houses.

6. Key informant household interview

☐ Ask the KI if he wouldn't mind his wife to also participate to the interview explaining the importance of the women contribution in the study

- ☐ Re-Introduce VERY BRIEFLY yourself, CORDIO, the purpose of the visit and the objective of the study stressing again the point that you are not there to control or enforce any law at all but just to LEARN.

- ☐ Explain that to make it focused and brief you will use a specifically tailored questionnaire and that this document is ONLY for internal use so they shall be as more open as possible:

- ☐ **Semi structured Questionnaire KI interviews (*this need to be piloted, is quite difficult to envisage the questions needed after the FDG and they need to be tailored to the KI according to whether a crew , owner or trader)***
