

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

Annex 2: LIVELIHOOD APPRAISAL

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1. Introduction

1.1. Aims and objectives

This report relates to Output 2, Activity 5 of the project logframe. The objectives of the livelihood appraisal were to carry out livelihood assessments at selected sites in order to:

- Carry out a stakeholders' analysis to inform the workshop process (logframe sub-activity 3.2, see section 1.2.2)
- Describe the relationship between fishers and their resources (logframe sub-activity 5.1, see Sections 2.1 and 2.2);
- Describe links between livelihood strategies and relative socio-economic status, and identify the most vulnerable groups to loss or mismanagement of fisheries resources (logframe sub-activity 5.2, see Section 2.3);
- Identify site-specific formal and informal management systems and institutions (logframe sub-activity 5.3, see section 2.4);
- Analyse and report the outcomes (logframe sub-activity 5.4)

The livelihoods appraisals also address Output 3, whereby local capacity and awareness of all actors involved in fisheries is increased, and linkages between stakeholder groups are strengthened at selected sites.

The livelihood appraisal complements and "ground truths" information gathered in the review phase, by providing more quantitative socio-economic information and more detailed knowledge on livelihood strategies and constraints of fisheries dependent communities.

1.2. Sites and stakeholders

1.2.1. Sites

On the basis of the selection criteria defined below, five sites were selected, two fishing communities in Tanzania (Bagamoyo District) (See Annex 1.1, Figure 1) and three communities in Kenya (Kilifi District, North Coast) (see Annex 1.2, Map 5). Site selection criteria were defined at the beginning of the project and were the following:

- Poverty: the studied communities should be poor as the project aims at targeting the poor
- Representative biophysical environment and resource use patterns
- Manageable and representative demographic size (no urban)
- Accessibility: This relates to logistics for research and workshop – cost, availability of transport, availability of facilities for the workshop
- Information should be available about the area but previous work at site should be minimal (no previous extensive studies, no on-going research work at sites)
- There should be no on-going project or established Marine Protected Area at the site.

The characteristics of the selected communities are described in Table 1. (See more on site selection in Annex 1.1, Section 6.1 and Annex 1.2, Section 5).

Table 1: Characteristics of the 5 selected communities

Country	Village	Approx. Size (households)	Location	Fisheries dependence	Socio-economic status	Access to location	Projects	Ecosystem	Gear used
Kenya	Chumani	150	Kilifi District (Kenya North Coast)	High	Poor	Easy	None	Barrier reef, lagoon	Spear guns, gill nets, hand lines
	Kidundu	104		Very High	Poor	Medium	None	Creek, estuary	Cast nets, hand line
	Mtondia	214		Medium	Poor	Easy	None	Barrier reef, lagoon	Spear guns, seine nets, hand lines
Tanzania	Kondo	222	Bagamoyo	Very high	Poor	Easy	A few	Coral reef, lagoon, mangrove	Beach seines, spear, hand lines, gill nets, cast nets/ring nets
	Mlingotini	196 (probably 300)		Very High	Poor	Easy	On going socio-economic monitoring Other past research	Coral reef, lagoon mangrove	Beach seines, spear, hand lines, gill nets, cast nets/ring nets

Poverty, dependence on fisheries resources, size of the communities and use patterns were examined in detail. The results are presented in the sections below.

1.2.2. Stakeholders and gender

A quick stakeholders analysis was carried out to inform the census workshop process (see Annexes 3.1 and 3.2). This was done through informal discussions mainly (see results in Table 2 and Table 3).

In the Kenyan sites, communities were mostly Giriama and Chonyi (from the Mijikenda tribes, refer to Annex 1.2, section 3), but migrant fishers from Pemba were also present. The former are mainly Christian whereas the latter are Muslims. In the Tanzanian sites, stakeholders were Muslims. The first part of the fieldwork was carried out during the end of Ramadan. This could have affected the research results, particularly in relation to food security research. However, the fast ended before the household surveys started (see section 1.3).

Stakeholders at the sites included fishers, fish traders (selling mainly fresh fish, fried fish, sea cucumber, lobster, octopus), boat makers, ice sellers and sea weed farmers (in Tanzania). Although most users were found to be local, a community of Pemba fishers was identified in Mtondia. These fishers have settled and have imported beach seining to this area. Seasonal migrant beach seine crews also fish in Kidundu every year. Three seasonal migrant crews from the South coast of Kenya go to fish in Chumani area, two crews use lines and one crew fishes for Octopus. No beach seiners are found in Chumani area as migrant beach seiners were prevented to come back by Chumani fishers. In the Tanzanian sites, again settled migrant fishers were identified from Pemba particularly in Mlingotini. Two boat makers in Mlingotini/Kondo area were migrants from Zanzibar but are now settled.

Table 2: Stakeholders in the Kenyan sites

Stakeholders		Type	Gender/Origins
Primary stakeholders	Fishers (men)	Nets Hand lines/long lines Beach seines Spear guns/spear Traps (very few)	Men, local except for: Handlines:20 fishers from South coast of Kenya during kaskazi Beach seines: some migrants from Pemba
		Tidal weirs Cast nets	Men, local. Gears are only found in Kilifi Creek
Secondary stakeholders in villages	Fish traders	Fish fryers (women) Fish traders Octopus traders/agents for octopus dealers	Women Men Men, local and from urban area (Kilifi)
	Boat repairer/makers		Men, local
	Trap makers	Malema maker	
Secondary stakeholders in Kilifi	Fishmongers	5 Fish shops buying and selling mainly in Kilifi Fish shop buying from Kilifi and further north on the Coast and selling in Kilifi and in Mombasa	One dealer also provides fishers with cool boxes for octopus
		Ice blocks seller	
Secondary stakeholders in Mombasa	Large companies	Processing octopus	Mombasa/ Foreigner
		Fileting	Company in Mombasa

Table 3: Results of stakeholders analysis in Tanzanian sites.

Stakeholders		Type	Gender/Origin/other comments
Primary stakeholders	Fishers	Nets Hand lines Beach seines Spear guns/spear Traps (madema) Uzioo Prawn nets Diving Dynamite	Men, local
	Sea weed	Seaweed farmers	Men and women, only in one area
Secondary stakeholders in villages	Boat owner		Man
	Fish traders/processors	Fish fryers and dryers Smoked fish traders Fresh fish traders selling outside of the village Fresh fish traders selling in streets Sea cucumber dealers	Women and men in one village (Dunda), only women in other villages Men, local and from other villages
	Boat repairer/makers		Men, one migrant from Zanzibar
	Trap makers	Malema maker	Man, local, only 1
	Ice seller		Only 1, local
Other stakeholders	Organisation	Fisheries development Institute	
Secondary stakeholders in Dar	Large companies	Sea weed marketing company	Dar es Salaam

Confirming what was found in the review the main fisheries stakeholders are fishers and fish traders, and fisheries-associated activities are mainly a male oriented activity. However, women are involved in some fishing (crab collecting and prawn fishing in the Kenya sites). Very few women were found trading fresh fish (one in the Kenyan sites), confirming the review findings that women are mainly involved in fisheries as fish fryers (Annex 1.1, Section 3.4.3, and Annex 1.2, Section 3.1.2).

Furthermore, the stakeholders' analysis found that very few community groups existed. Only two groups were mentioned, one in Mtondia, the aim of which was to provide storage for fish, and one group in Kondo which was a lobbying group for fishers. The lack of community groups is stressed again later in this analysis and identified as a constraint for the livelihood development of fisheries dependent people (see section 2.4, 2.5 and 3.4). The lack of effective community groups was also a finding of the review (Annex 1.1, Section 4.3.1, and Annex 1.2 Section 3).

1.3. Process and methodology

1.3.1. Sensitisation and villagers attitude

The first step of the fieldwork involved sensitising and informing the villagers of the research and problem census workshop process. This was done through two preliminary visits to the village chairmen/village committees. During these visits, the researchers asked the village leaders permission to carry out research in their villages, introduced the aims of the project and the methodology. Village leaders were also asked to suggest key informants to list the

households for the occupational structure process, and key people who could help the socio-economist.

Most of the selected villages were keen to participate in the research project. This research and project came at a time when fishermen and fish traders were organising themselves in groups to help alleviate the protein deficiency problem in the Kilifi area. The team had encountered difficulties in only one village (Mlingotini in Tanzania) where, after the initial sensitisation, villagers and particularly village leaders were reluctant for the research to be carried out. This seemed to be the result of informant fatigue due to several current and previous fisheries research studies in the area.

1.3.2. Training/capacity building

Training was given on the use of socio-economic information in fisheries management and on participatory research methods. The training targeted Fisheries Department personnel and the socio-economic researchers, and concentrated on resource use patterns and occupational structure (see next section). In Kenya, the whole Kilifi District Fisheries Office including the District Fisheries Officer participated in the training session as well as fisheries personnel from the Provincial office (Mombasa). The training was conducted over two days. The first day methods and information were discussed. A fieldwork session was done on the second day. Due to conflicting meetings, the fieldwork practice could not be carried out in Tanzania but the Fisheries Assistant was involved in data collection from the beginning of the fieldwork. Training notes based on the GCRMN Manual (Bunce *et al*, 2000) were provided.

10 community members (a man and a woman in each village) were hired to carry out household surveys. The household survey questionnaire was discussed with them and they were trained on interview techniques. The training was done over two days, the first day was to discuss and practice administering the questionnaire (the interviewers went to test the questionnaire), the second day was to discuss problems and necessary amendments of the questionnaire. The interviewers were young and literate and had just finished school.

1.3.3. Methods

Participatory methods (Bunce *et al*, 2000, Slocum, 1995, Chambers 1994, 1992) as well as a household survey (questionnaire) were used to gather information for the livelihood appraisal.

1.3.3.1. Key informant interviews (Occupational structure) and informal interviews

Key informant and informal interviews were used to determine the communities' dependence on fisheries resources.

The occupational structure of a community shows what activities people do for a living, be it for income or subsistence. This can give an indication of a community's dependence on marine and coastal resources. To determine the communities' occupational structure, key informants agreed a definition of 'household' with the research team and then were asked to list all households in the community. For each household they determined activities carried out for either food or income. An additional benefit of the household list is that it can then be used as a sampling frame for further research (Berkes *et al*, 2001). The data gathered through the occupational structure shows the proportion of households depending on fisheries resources.

Three to six key informants in each village were interviewed by the research team to develop the occupational structure of each village. These were middle aged to older men and women because it was important the key informants knew everyone very well.

Due to the relatively large size of the communities, two to three two-hour sessions were required to complete the list of households. In Mlingotini, the households list was not completed due to villagers' reluctance to participate in the research, however it was believed that around 75% of the households were covered, thus a sufficient proportion to carry out the analysis.

Informal interviews were also used to investigate whether fisheries resources were mainly exported or consumed at the village level.

1.3.3.2. Focus groups and semi structured interviews

Focus groups based on user groups (fishers grouped according fishing gear/type, fish fryers, sea weed farmers) and semi-structured interviews (fresh fish traders, boat makers, ice sellers) were used to investigate:

- The relationship between fishers and their resources and fisheries-dependent livelihoods
- Site-specific formal and informal management systems and institutions;
- The constraints to sustainable fisheries-dependent livelihood development

Focus groups were composed of 6 to 8 participants of different ages. During the focus groups and other semi-structured interviews, the way in which stakeholders used the resources were discussed (see interview guide example, Appendix 1). Methods, location, number of users, assets, catch, income, and timing of activities were investigated. Formal and potential informal management systems were also discussed as well as problems and constraints perceived by the stakeholders.

In total 23 focus groups were carried out (10 in the Tanzanian sites and 13 in the Kenya sites). Fisher focus groups were organised according to gear types and included focus groups to discuss nets, mixed gear, spearguns, beach seines, crab catching and cast net fishing. Focus groups with fish fryers were carried out. Discussions with boat builders and fresh fish or specialised fish traders (octopus or other) were carried out through semi structured interviews. The focus groups were carried out by the socio-economists and took two to three hours each.

1.3.3.3. Household surveys

A questionnaire was used to investigate the links between livelihood strategies and relative socio-economic status as well as identifying the poorest groups (see section 2.3 for the poverty indicators used in this study). Results of the household survey were also used to provide more detailed information on dependence on fisheries resources.

The questionnaire was composed of two parts. The first part concentrated on household characteristics and socio-economic status based on Material Style of Life (Berkes *et al*, 2001, Pollnac and Crawford, 2000) data complemented by food security information. The second part was essentially looking at more detail on the characteristics and activities of fisheries dependent households in order to complement the occupational structure results and enable more detailed investigation on the linkages between socio-economic status and fisheries dependent livelihoods specifically (see questionnaires Appendix 2). Questionnaires were administered in Swahili in Tanzania and in mixed English/Swahili in Kenya, this was the preference of the interviewers.

The questionnaire took no more than 10 to 15 minutes to administer. The household survey took no more than 5 days in each village as between 30 and 60 households were sampled in each village. The sampling strategy and frequency is indicated below.

1.3.3.4. Sampling

The household was chosen as a unit of study as it is assumed that it is the unit at which resources are pooled and decisions are taken about consumption, production and investment (Corbett 1988). The definition of "household" agreed upon with the informants was: the people living together sharing food and money. This definition was similar to the sociological "common-cooking pot definition" of the household: "a group of persons sharing a home or living space, who aggregate, and share their incomes, as evidenced by the fact that they regularly take meals together" (Marshall 1994).

Non random as well as random sampling methods were used. For the Occupational structure, purposive sampling was used (Bernard, 1995). Informants (men and women who knew the community well) were suggested by the village chairman according to the need of the research.

The household list provided by the occupational structure was used as a sampling frame and households for the household survey were selected randomly (random numbers were generated by computer). 18% to 36% of households listed were sampled. Table 4 shows the number of households sampled in each village and the proportion it represented.

Table 4: Number and proportion of households sampled during the household survey

Villages	Number of household sampled	% of total listed households
Chumani	55	36
Kidundu	35	33
Mtondia	63	29
Kondo	40	18
Mlingotini	40	20

Stratified random sampling was used to select participants for the focus groups (Bernard, 1995). Focus group participants were selected randomly within groups of households depending on the activities the research was concerned with. The sampling frame was also provided by the occupational structure list of households.

1.3.3.5. Analysis

Basic statistics were used to analyse data on the dependence of communities on fisheries resources. Analysis of Variances, simple t-tests and Pearson correlations were used to analyse the data collected through the household surveys.

1.4. Fieldwork team

In each site, the team was composed of the leading consultant, a fisheries officer/assistant, a socio-economist, local coordinators and local interviewers. Their roles are described in Table 5.

Table 5: Team members and their roles

Team members	Roles
Consultant: Dr D. King	Train socio-economist, fisheries assistants, community members, set up data collection, sensitise communities, start collecting the occupational structure data, design household survey questionnaire and sampling strategy for household surveys and focus groups.
Socio-economists: Kenya: Mr Tunje Tanzania: Ms Meela	Collect occupational structure data, coordinate and lead the fieldwork and data collection when the consultant is gone.
Fisheries Assistants: Kenya: Mr Mwalumbo Tanzani: Mr Mpossi	Be trained in socio-economic data collection, importance of the information and participation to the data collection particularly the focus groups
Local coordinators: Kenya: Mr Shemte, Mr Katana Tanzania: Mr Mohammed	Community members whose role was to help socio-economist organising the focus group, intermediary between the socio-economist and the villagers.
10 local interviewers	Community members trained in socio-economic data collection, and administrating questionnaires. Carry out the household surveys.

2. Results of the livelihood appraisal

2.1. Dependence on fisheries resources at the local level

2.1.1. Dependence on fisheries resources at the community level

Both the household survey and occupational structure data were used to determine the dependence on fisheries at the local level.

Fisheries related livelihoods important in coastal Kenya and Tanzania (see review, Annex 1.1, Section 3.4.3, and Annex 1.2, Section 3). This was confirmed by the livelihood appraisal (see Table 6). The percentage of households depending at least partly on fisheries resources (at least one member of the household is involved in a fisheries related activity) is higher on average in Tanzania (68.4%) compared to Kenya (43.5%) based on the studies at representative sites.

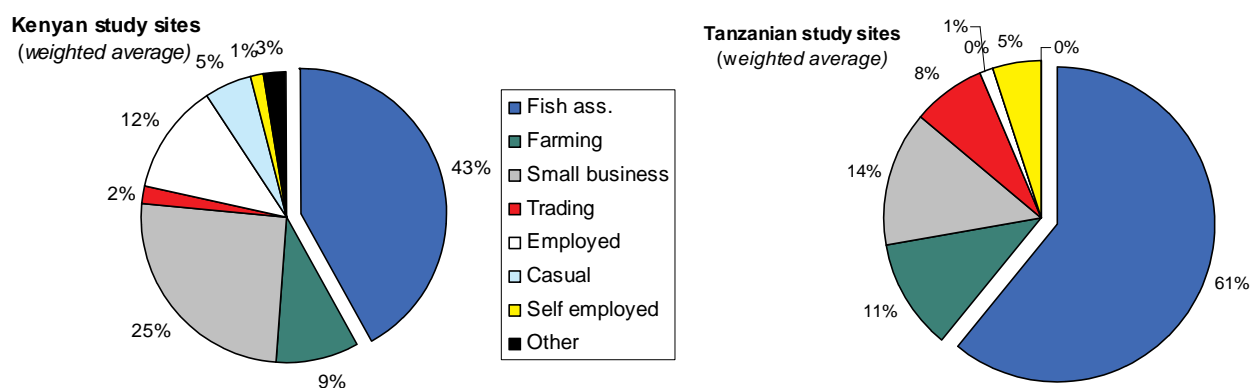
Table 6: Number and Percentage of households depending at least partly on fisheries associated activities* (source: occupational structure)

	Number household fisheries dependent	Percentage	Total households
Chumani	45	30	150
Kidundu	74	71.2	104
Mtondia	84	39.4	213
Total, Kenya	203	43.5	467
Kondo	155	69.8	222
Mlingotini	131	66.8	196
Total, Tanzania	286	68.4	418

* includes, fishing, all forms of marine product trading, sea weed farming, boat making, ice selling.

The households' most important activity in terms of income (activities ranked first for the whole year in the household survey) aggregated at the community level, showed that fisheries related activities were the most important (in blue Figure 1) both in Kenya and Tanzania. Small business (which includes selling wood, food, small trading activities) and farming/casual labour followed.

Figure 1: Proportion of households depending mainly on each activity (source: household surveys)



Fish ass= fisheries associated livelihood, small business= selling foods, small trading, wood, charcoal, weaving, trading= households owning shops, employed= includes all people employed by the tourism industry, as house staff, by the government, casual= mostly people working as farm labour for other households or quarrying on a daily basis, self-employed= includes people with their own business such as tailor, mechanic, hair dressers, carpenters, other=this category is mainly composed of traditional doctors and pensioners (ex-government employees).

2.1.1.1. Dependence on fish for income

A high percentage of households depend at least partly on fisheries (Table 6 and Figure 1) but none of them depend only on fisheries for their livelihood (income and subsistence). Most of the fisheries households depend on farming or small business as well. The peak farming activities occur just before and during the long rains when land is prepared and crops (mainly maize, cassava, rice, beans) need weeding and are harvested. The long rains and southern monsoon (April through to June) correspond to the low fishing season, when strong winds and rough seas make fishing more dangerous and access to better fishing grounds difficult. Thus fishers concentrate on helping their wives with farming activities at this period of the year. The main cash crops are cashew nuts, mangoes and coconuts.

However, although fisheries dependent households do not depend entirely on fisheries for their livelihoods, fisheries may be the most important livelihood component. This is the case for fishing households, which represent more than 75% of fisheries dependent households. Fishing was ranked as the first source of income by 68% of fishing dependent households in Kenya and 87% in Tanzania (see Table 7). 8.3 % in Kenyan sites, and 56.1 % in the Tanzanian sites depended only on fishing for income. This confirms a Kenyan case study in Diani where the high dependence on fishing, even though not the only source of livelihood was documented (Malleret-King, 1996, see Annex 1.2, section 3) and it was found that fishing households depended on fishing for at least 78% of their income and subsistence.

Fishing households do not depend only on fishing for their livelihood (see also Annex 1.1, Section 3.4.4 and Annex 1.2, Section 3) and that most households farm, or carry out small businesses in the low fishing season. This was found in the Diani and Shimoni area (South coast of Kenya, Malleret-King 1996, 2000).

Table 7: Activities ranked first as source of food and income by fishing households
(source: household surveys)

		% Fishing households	
Activity ranked first		Kenya (N=72)	Tanzania (N=41)
Food	Fishing	37.5	34.1
	Fishing frying	1.4	0
	Fish trading	0	0
	Farming	61.1	65.8
	Other	0	0
	Total	100	100
Income	Fishing	68	87.8
	Fishing frying	2.8	0
	Fish trading	1.4	2.4
	Farming	9.7	2.4
	Other	18	7.3
	Total	100	100

2.1.1.2. Fish as a source of food

Farming is the main subsistence activity (over 60% of the fishing households ranked farming as their main source of food for the whole year (see Table 7)) but fishing is also an important source of food for these households besides its income providing role (more than 30% of fishing dependent households interviewed ranked fishing as their first source of food).

It was found from the focus groups that fishermen primarily sold their catch. According to the focus group discussion, a small amount would be kept for the household only if the catch was very good. It was also suggested that most of the fish sold was exported outside villages. Only fish fryers sell their fish in the village. The major export of fish outside villages was thought to have contributed to the significant amount of protein deficiency disease in the Kilifi area mentioned in Annex 1.2, section 3.

When investigated more closely, it was found that fish consumption both by fisheries dependent households and non-fisheries dependent households was high despite the export of fish outside the villages and despite fishermen selling most of their fish. Meat consumption, investigated as a comparison was much less frequent.

Household survey findings show that in all Kenyan sites, more than 70% of the fisher households eat fish more than once a week (see Table 8) and more than 70% of fishing households in all villages eat fish at least once a week over the year. In Chumani, 14 % of fishing dependent households eat fish less than once a month and in Mlingotini, 13% of the fishing households said they did not eat fish. The rare consumption of fish in these households might come from the lack of fish availability or a dislike of fish (this was not investigated). Meat consumption followed a contrary pattern, more than 45% of fishing households consumed meat less than every two weeks with a higher percentage consumes meat only 1 to 5 times a year. The frequency of fish and meat consumptions was determined over the whole year.

Table 8: Frequency of fish at consumption by fishing households (%)- *in italics, meat consumption-* (source: household survey)

	More than once a week	Once a week	Every two weeks	Every 1 or 2 months	1-5 times a year	Never
Chumani	71.4	4.8	9.5	0	14.3	0
Kidundu	80	10	0	10	0	0
Mtondia	95	5	0	0	0	0
Kenya	81.7 (7)	7 (9.8)	2.8 (5.6)	4.2 (29.6)	4.2 (43.7)	0 (4.2)
Kondo	38.9	44.4	11.1	5.5	0	0
Mlingotini	17.4	52.2	8.7	8.7	0	13
Tanzania	26.8 (2.4)	48.8 (4.9)	9.7 (0)	4.9 (17.1)	2.4 (63.4)	7.3 (12)

The frequent consumption of fish is also noticed when other fisheries dependent households were separated. More than 50% of other fisheries dependent households eat fish at least once a week (Table 9). The percentage is particularly high in Kenya where 85 % eat fish at least once a week. More than 80% of these households were found to consume meat less than every two weeks in both countries.

Table 9: Frequency of fish and meat consumption by other fisheries dependent households (fishing households excluded) -*in italics, meat consumption-* (source: household survey)

	More than once a week	Once a week	Every two weeks	Every 1 or 2 months	1-5 months a year	Never
Chumani	66.7	0	16.7	16.7	0	0
Kidundu	100 (only 2 ind.)	0	0	0	0	0
Mtondia	78.6	14.1	0	7.1	0	0
Kenya	77.3 (4.2)	9.1(4.2)	4.5(4.2)	9.1(62.5)	0(20.8)	0(4.2)
Kondo	42.8	14.3	14.3	14.3	14.3	0
Mlingotini	25 (only 4 ind.)	25	25	25	0	0
Tanzania	33(0)	20(0)	20(0)	20(28.6)	7(64.3)	0(7.1)

Fish consumption is not as frequent in non-fisheries dependent households. About 16% and 41% of households in Kenya and Tanzania respectively consume fish a little as from once a month to never. However more than 50% of these households still consume fish at least once a week (Table 10). More than 60% of the non fisheries dependent households consumed meat less than every two weeks in both countries.

Table 10: Frequency of fish consumption by non-fisheries dependent households (%)- *in italics, meat consumption-* (source: household survey)

	More than once a week	Once a week	Every two weeks	Every 1 or 2 months	1-5 months a year	Never
Chumani	27	27	15.4	23.1	3.8	3.8
Kidundu	50 (only 2 ind)	0	50	0	0	0
Mtondia	92.8	3.6	0	3.6	0	0
Kenya	60.7 (12.5)	14.3 (8.3)	8.9 (14.3)	12.5 (28.6)	1.8 (35.7)	1.8 (0)
Kondo	35.7	14.3	0	28.6	14.3	7.1
Mlingotini	7.7	46.1	15.4	30.8	0	0
Tanzania	21 (0)	29.6 (0)	7.4 (0)	29.6 (14.8)	7.4 (66.7)	3.7 (18.5)

Fish is an important source of protein in the villages studied for both fisheries and non fisheries dependent households. The low fishing season has an impact on fishers and fish traders as well as the wider community: the consumers. Fish traders have their activities affected, and consumers are affected by prices being higher due to lower fish availability.

In Tanzania, a household was considered wealthier if its members ate meat rather than fish, which suggests that meat is less affordable. However, in Kenya, fishers suggested that they did not eat fish much. This was contradicted by the above findings, which showed that fish is consumed frequently while meat, the most likely substitute, is consumed more rarely. Cheaper beef meat was about double the price of cheaper fish (180 Ksh per Kg against 50-60 Ksh per Kg – see Table 14)

2.1.2. Summary

Dependence on fisheries resources is only partially documented and there is little quantitative information available (see review, Annex 1.1 and 1.2.). However, review findings suggest that in Tanzania, coastal people depended on fisheries resources for 60% of their animal protein intake (see Annex 1.1, Section 3.4.1) and that fishing is an important source of livelihood, with for example, more than 50% households in the Shimoni area (Kenya) depending on fishing at least partly (Malleret-King, 2000, Annex 1.2, section 3).

The results of the livelihood appraisal confirm and complement the review results, showing that fisheries resources are essential for income and for food at the local level. This suggests that fisheries dependent households, as well as the wider community would be vulnerable to the loss or mismanagement of fisheries resources. By carrying out more in-depth analysis, the livelihood appraisal contributes to determine quantitatively their level of dependence.

Dependence was studied at different levels; at the community level and at the household level. At the community level, on average, more than 40% of households in coastal Kenya depend on fisheries associated activities for their livelihoods, and the proportion reaches more than 60% in coastal Tanzanian households. Fishing represents the main fisheries dependent activity (more than 75% of the fisheries dependent households depend on fishing itself, as opposed to fishing-dependent activities).

Dependence on fisheries was found to be high at the household level in terms of food and income. Although no households depend exclusively on fisheries for their livelihood (cf. 2.1.1.1), fishing represents the main source of income for most of the fishing dependent households (more than 60%). Fish also appears to be one of the most important sources of food for more than a third of fishing households in both countries. The importance of fish as food was also investigated in more detail, and it was found that, on average, more than 70% of fisheries dependent households eat fish more than once a week, this was also the case for more than 50% of non fisheries dependent households (75% in Kenya and 50% in Tanzania).

Very little secondary quantitative information was available on the dependence of coastal communities on fisheries resources, this was an information gap identified in the review (Annex 1.2). The above results confirm how important fisheries resources are for the coastal people of Kenya and Tanzania.

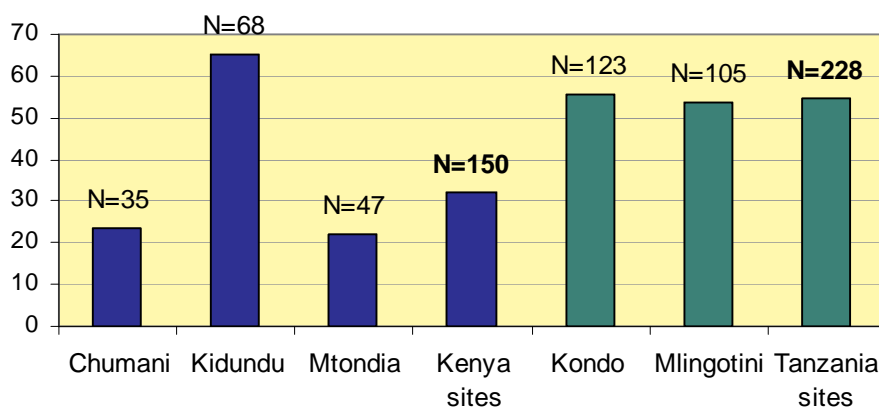
The high dependent on fisheries resources could suggest the lack of alternative sources of income in coastal Tanzania and Kenya, leading to pressure on the resources (see section 2.5).

2.2. Understanding better fisheries dependent livelihoods (resource use patterns)

2.2.1. Is fishing the most important activity on coastal Kenya and Tanzania?

As suggested in section 2.1 and illustrated by Figure 2 below, fishing as such is one of the most important households' activities at the study sites, particularly for income as shown in section 2.1. The village the least dependent on fishing is Chumani in Kenya with 23% of its households depending partly on fishing. The most dependent on fishing is Kidundu again in Kenya, with 65% of the households depending partly on fishing.

Figure 2: Percentage of households depending at least partly on fishing itself (source: occupational structure)



On average, fishing is relatively more important in Tanzania than Kenya (55% against 33% of households dependent on fishing), according to this sample. The proportion of fishing households is lower in the Kenyan sites than what was suggested by Malleret-King, 2000 for the Shimoni area, where on average 54% of the households depended on fishing (see Annex 1.2, section 3).

2.2.2. Fishing characteristics

2.2.2.1. Boats

Fishing at the selected study sites is artisanal and small scale. Boats used are mainly small dug out or outriggered canoes poled or sailed. Boats are used to fish with nets, hand lines and traditional traps, as well as diving for octopus. It was found that most fishers do not own a boat and a high percentage of fishers do not use boats at all (see Figure 3).

Figure 3: Proportion of fishing households with fishers using or not using boats for fishing (source: household survey)

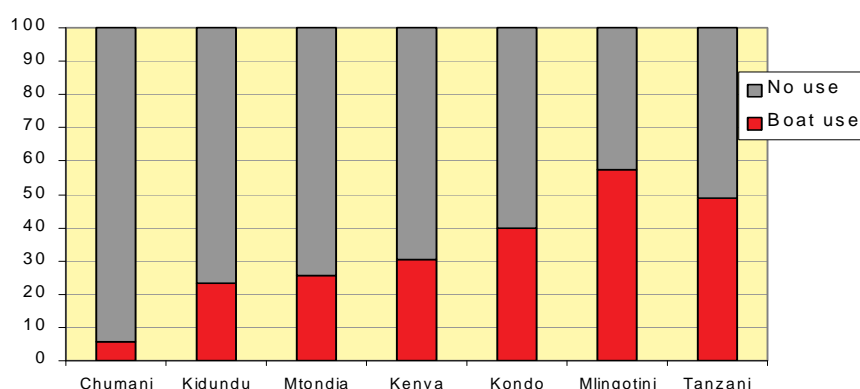


Figure 3 shows the proportion of fishing households with no access to boats is higher in Kenya than in Tanzania (69.6% against 52%). It was thought that it could be related to the fishing methods, particularly in Chumani where hardly any boats are used and where spearguns and spears are the most widely spread method of fishing (see Figure 4), fishers swim or walk to their fishing grounds. However, nets are also widely used in Chumani (see Figure 4) and when interviewed during the focus groups, all fishers mentioned the lack of boat as one of their main problems (see section 2.5).

The low proportion of boat use is due to the relatively high cost of boats. Prices vary according to the size, the quality of the wood and the type of boat produced. Prices vary from 41.7 GBP (5000 Ksh) for what was described as a soft wood dug out canoe to 200 GBP (300 000 Tzsh) for a large out rigger in Tanzania. A boat made in soft wood will last around 3 to 5 years and a hard wood boat could last for 20 years.

The proportion of households owning and using their own boats was also very low (see Table 11). The proportion was also higher in Tanzania (nearly half on average) than in Kenya (36%). Little quantitative information was available in the review however, the livelihood appraisal findings compare to the 40% found in the Shimoni area in Kenya, Malleret-King, 2000 (Annex 1.2, section 2). For Tanzania, no information was available in the review as to the proportion of fishers using boats, although it is noted that, for the most recent available figures for the marine fishery, the number of fishers was approximately four times the number of fishing boats. In Tanzania, the most commonly used boats by artisanal fishers are dugout canoes (50%) and outrigger canoes (25%) (Annex 1.1, Section 2.2).

Table 11: Percentage of boat using household also owning a boat (per type) (source: household survey)

Location	Proportion who use a boat	Proportion of those using a boat who also own a boat			
		Dug out	Out rigger	Dhow	N
Chumani	5.7		33.3	33.3	3
Kidundu	23	26.9			26
Mtondia	25.4	46.7			15
Kenya	30.4	31.8	2.3	2.3	44
Kondo	40	25			16
Mlingotini	57.5	43.5	21.7		23
Tanzania	48.7	35.9	12.8		39

The variation between villages is strong. From Mlingotini and Mtondia where about half boat using households also own a boat and Kondo and Kidundu for example where only a quarter of boat using households own also their boat. In the case of Chumani there are too few boat using households (3) to analyse the data further with confidence.

Commonly fishers share a boat. Boats are usually owned by one individual, but can also be owned between 2 to 6 fishers. The most common is for fishers to share a boat between two or three to go fishing. In the case where boats are owned by individuals, fishers share the catch and give a share for the boat. It was found that some fishers rented boats, on a monthly basis for example in Kondo. They also could rent a boat on an occasional basis.

Most of the boats used are dug out canoes (Table 11) and outrigger canoes. Out of all the sites, only one group of fishermen used an engine-powered boat. These were migrant fishers from the South coast of Kenya, who seasonally come fishing for octopus in Mtondia. The boat was owned by an octopus trader.

2.2.2.2. Gear use

A wide spectrum of gear was represented at the sites:

Gill nets: of 3-4 ply and of 2.5-3 inch mesh from 50 to 100m long are usually set by boat, and left all night in deeper areas. Nets 50m long with 3-inch mesh size are also used, set by foot, particularly in Chumani. Fishers spot the fish and encircle them while beating the water to drive the fish in the net in the shallow areas. Shark nets with larger mesh size (4-5 inches), also on average of 50 m in length are also set all night but in deeper waters by 4 to 6 fishers in a boat. As shown in table 12, these types of nets are used in both seasons, mainly inshore during the southern monsoon, and offshore (if boats are available) during the calmer season. This method of fishing is done at low tide and during night and day time depending on the tide. Target species include both demersal and pelagic species.

Cast nets: are used in Kondo and Kidundu. These are small size and small mesh size, nets that are cast over sardines, prawns or small fry (dagaa). Cast nets are used at low tide, during the day or at night mainly in sandy or muddy shallower areas. They are used in both seasons, however it is more frequently used during the prawn season, particularly in Kondo, during the north monsoon. Boats were used to fish with cast nets.

Beach seine: Beach seines are very small mesh size (about 0.5 inch) nets. Fishers on a boat spread the seine over a large area encircling a group of fish, while the two extreme ends of the net are held by two groups of fishermen at the beach. The two groups then pull the net to the beach, harvesting both targeted and non-targeted species and usually scraping the sea bed. Several fishers snorkel under water to release the net in case it gets stuck. Boats are usually large outrigger canoes (carrying 10-20 fishers). Fish species caught include all types of demersal reef and herbivorous fish, usually small size (dagaa). Beach seining is obviously carried out nearshore, in all seasons, during day time at low tide and preferably over sandy bottom.

All nets are bought and mended by the fishers themselves.

Spear, spear guns, sticks: These are home made. Crabs are collected in mud flats/mangrove areas, with hooked sticks, during low tide and in all seasons. Divers use sticks or spearguns or nothing to target lobsters, octopus, sea cucumber and reef fish (see Table 12). Lobster pots are sometimes also used. This type of fishing would require the use of fins, masks and snorkels to be effective. It does not require the use of a boat. Diving is done in

both seasons although preferably during the northern monsoon. According to the season (calm or rough seas), inshore reef areas or outer reefs are chosen.

Fence traps, traditional traps: These are very rarely used in the selected villages. Fence traps can be fixed larger structures or light removable ones. Harvesting occurs at low tide when fish are trapped at the end of the fence. The larger structures are made of large poles (see review). The light removable traps are made up of 10 – 15 separate pieces of reeds of about 15 ft. These are joined together using a rope. These target prawns, specifically, which are harvested by hand or using a cloth. Traditional home made traps are hexagonal woven basket traps left overnight and target herbivorous demersal fish generally. Basket traps are set using a boat at low tide.

Handlines: handlines are very common and fishers often use them as well as nets. They are bought. They are mainly used from boats, in all seasons, in both tides. The preferred location to fish with handlines varies with the season and thus targeted species as well (see table below).

Table 12: Fishing grounds, timing, species caught per gear

	Area	Timing	Species
Crab stick	Mud flats, mangrove areas	Both season Day. Low tide.	Crab
Diving: spear gun, spear/stick, lobster pot	SM: Inshore, rocky areas, sea grass. NM: Outer reef	Both seasons (better north monsoon) Day and night. Low tide.	Octopus, lobster, sea cucumber, rock cod, reef fish and parrots..
Handline	SM: Inshore NM: Offshore if they have boats, deep sea.	Both seasons. Day and night. Low or High tide.	Reef fish Pelagics: tuna
Traps	Mud flats, sandy areas. Inshore.	Both seasons. Day. Low tide.	Prawns, lethrinids, juvenile reef fish, catfish
Gill nets (2.5 to 5 inch net)	SM: Inshore (sea grass, sandy area) NM: Deep sea and channels.	Used both season. Night and day. Used at low tide.	Reef and herbivorous demersal fish Pelagics: ray, jacks Squid
Cast net	Shallow areas, muddy, sandy bottom. Deeper waters in DS.	Both seasons, but higher season in Tanzania during the North monsoon. Day and night. Low tide.	Sardines, prawns, dagaa.
Beach seine	Inshore shallow areas. Sandy bottom. Channels.	Both seasons. Day. Low tide.	Dagaa (small fry) mainly in Tanzania Sardines, all types of reef fish/herbivorous fish. Usually small size.

*NM: North monsoon, SM: South monsoon.

Most fishing methods are affected by the monsoon pattern, particularly due to the accessibility of fishing grounds. Thus fishing activities are located inshore during the rainy season when the seas are rough and winds are strong, and when possible offshore during

the dry season and only by the small proportion who has access to boats. Fishing is also mainly carried out at low tide when seas are calmer and fishing grounds can be accessed by foot. A large number of fishers do not use boats.

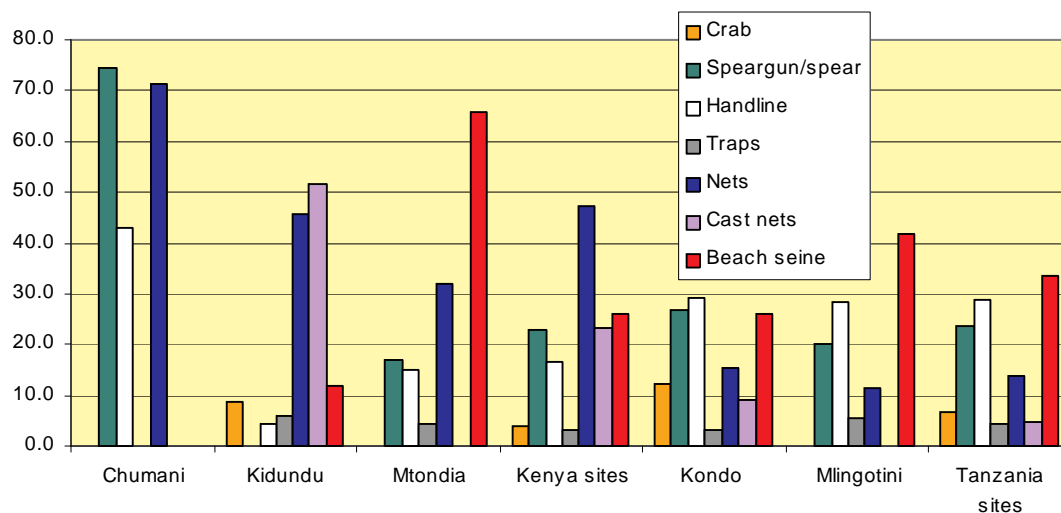
It was found from the focus groups that all fishers change fishing grounds very often, and most go fishing twice a day. Depending on whether they have boats or not, fishing takes 2 to 4 hours (without boats) and can take 6-7 hours with a boat as fishing grounds can be located further away. Fishers reported taking 30 to 90 minutes on average to reach their fishing grounds, depending on the season and on the use of boats.

For the purpose of the analysis, in the results below, "nets" refer to gill nets (used with or without boats) and shark nets. Cast nets and beach seines are two separate categories. Cast nets because they target totally different species to gill nets, and beach seine because it is a controversial gear, considered very destructive. Traps are one category (traditional basket traps and fence traps), spear/speargun /diving which are methods carried out in similar areas, in similar ways are aggregated in one category and finally "crab" refers to crab fishing. Finally handlines are separated.

The results presented below are based on occupational structure data. It was planned to use the household survey to have more detailed information, however interviewers did not differentiate between nets when discussing gear used by fishing households. The use of beach seines was not specified.

Results show that the most common gear used at studied sites are nets, particularly beach seines (except in Chumani), and spear/speargun/diving, particularly in Kenya. Handlines are also widely used, particularly in Tanzania, traps are very rare, and crab fishing is only done in two of the five villages.

Figure 4: Percentage of fishing households using different gear



Note: The distribution of gear does not add to 100% as households and fishermen often use more than one gear.

Overall, more than a quarter of the fishing households at the study sites fish with beach seines in Kenya and a third in Tanzania. Little information on the proportion of gear use was found during the review, however, the results of this study compares with McClanahan *et al.* (1996) results in the south coast of Kenya, where 26% of fishers at the studied landing sites were using beach seines in 1995-1996. It also compares to Wanyonyi *et al* (2003) results

where beach seines were found to be the second most used gear in the Diani Chale area in Kenya (Annex 1.2, section 2).

The proportion of beach seines was particularly high in Mtondia (Kenya) where two thirds of the fishing households use such a gear. Nets are used in all villages (from 11% of the fishing households in Mlingotini to 71% in Chumani) and handlines, from few in Kidundu for nearly half fishing households in Chumani. Finally spear/seargun and diving are very common except in Kidundu. This is explained by the fact that Kidundu fishing grounds are located in a Creek (no reef, often turbid waters). Overall nearly a quarter of fishing households in Kenya and Tanzania use spears or spearguns. The findings on the importance of spear guns and beach seines in Kenya confirms the results of previous research in the South coast (Rubens, 1996, McClanahan et al, 1996, McClanahan and Mangi, 2001, and Wanyonyi *et al.*, 2003. See Annex 1.2., section 2). Findings on the importance of gillnets confirm results the most recent studies (McClanahan and Mangi, 2001, and Wanyonyi *et al.*, 2003). No quantitative information was available on actual gear use in Tanzania, although the recorded number of different gear types was available. The review findings for Tanzania indicate that shark nets, traps scoop nets and gill nets have been used extensively, with ring nets being less used (Annex 1.1, Section 2.2.2.1 and Appendix 3).

Although the review suggests that traps were widely used (used by most of the fishers in Shimoni area, Malleret-King, 2000, use by 18% of the fishermen in Diani, McClanahan *et al.* 1996, Annex 1.2, section 2, and from the review interviews), this was not the case in any of the study sites whether in Kenya or Tanzania. Home made traditional traps were hardly used, similarly, tidal weirs have nearly been abandoned (two or three fishers in the villages used tidal weirs or traps). Small removable fence traps, used in Kidundu are also very rare.

The reason for the decreasing use of traps was investigated during the focus group. According to trap fishers (all elders), the younger generation prefers going fishing with nets which they believe is a quicker and better way of making money. Furthermore trap fishing requires skills to make the gear that younger fishers have no patience to learn.

Crab fishing, using a curved stick, is mainly done in Kondo and Kidundu. Women do it as well.

2.2.2.3. Gear choice

The choice of gear can be determined by skill, age, personal preferences (catch expected) but one of the main factors is cost. The price of the gear itself and the need for other capital to use the gear is an important factor in the choice of the gear (see Table 13), this was one of the review findings for Kenya and Tanzania (Annex 1.1, section 2.2.2.1, and Annex 1.2, section 3).

Table 13: Users, cost of gear and average daily catch

Gear	Gender and origin of users	Age	Cost gear in GBP	Further equipment needed and cost	Average daily catch per fisher
Crab stick	Men and women All ages Local fishers		0-1 GBP if hooks are used.	None.	2-5 kgs No marked seasonal difference
Diving: spear gun, spear/stick, lobster pot	Men Young Local		0 (stick, lobster pot) 2.9 GBP (home made spear gun).	Flippers, goggles, snorkel, buoy: 16.7 GBP	Dry season: 5-10Kgs Rainy season: 0.25-3kgs
Handline	Men All ages Local and migrants		2.5- 5 GBP*	Some do not use boats but boat usually needed.	1-5 Kg. 10 Kg (migrant fishers, go deep sea)
Traps	Men Elder Local		Usually home made	Boat if traditional traps.	2-5 kgs (change according to season)
Gill nets (2.5 to 5 inch net)	Men Young and middle age Local		41.7-83.4 GBP for 50 to 100m net	Boat. Some do not use boats.	5-20 Kg (marked change according to season)
Cast net	Men Middle aged and Elder Local		6.7 (home made)-20.5 GBP (bought)	Boat.	1-3 Kg in season
Beach seine	Men Young and Middle age Local and Migrants		58.3 (Kenya) to 250 GBP (Tanzania)	Flippers, goggles.. Boat.	5-25Kg (no marked difference according to season)

*The price of the hand line depends on the weight of the line and on the number of hooks

Fishing is mainly done by local fishers, however, in Chumani two groups of migrant fishers from the South coast of Kenya fish seasonally with handlines and go diving for octopus. Settled migrants from Pemba/ Tanzania fish with beach seines in Mtondia, and migrant fishers use beach seines seasonally in Kidundu. Only the Tanzanian migrant fishers settled in Kondo use spear/diving.

The use of gear that involves diving and hard swimming or heavy weights to pull (large nets) is usually the activity of young and middle aged men as the energy required is high. This was mentioned in the review and confirmed in the studied sites. Elder fishers use traps and hand lines mainly. Similar findings were obtained from the review in Kenya (Annex 1.2, Section 2-Rubens, 1996).

Although the catch figures are likely to be overestimated due to the high range of daily variability, it came out from the focus groups that the larger catch is expected from nets and beach seines. The relative high performance of gillnets was found during the review for Kenya (gillnet was found to be the gear providing the best catch in Diani by Rubens (1996)-see Annex 1.2, section 2.). Figures from the review for Tanzania showed catch rates to be highest from surrounding nets, however gill net catch rates were approximately 50% lower (Annex 1.1, Section 2.2). For hand line fishing, which is most commonly conducted in outrigger canoes, catches per day range from 20 to 30 kg at most (Annex 1.1 section 2.2.2.1). The livelihood appraisal do not show similar, however this does not compare to figures for the Diani fishery in Kenya where spear guns got the lowest mean catches (Rubens, 1996). However, it was found that in all sites, catches mentioned were similar. The least catch per fisher is expected from traps and cast nets (see Table 13). The low performance of the trap confirms review findings for Kenya (Rubens, 1996) and Tanzania (Annex 1.1, Section 2.2).

Most focus groups mentioned that catch will vary according to season particularly for gill nets, hand lines, traps and cast nets. The reason the variation is strong for these gears is the difficulty to access fishing grounds during the low season. In the case of cast nets, the reason is the seasonality of the prawns and sardines. The seasonality in the catch confirms the review findings (Annex 1.1, section 2.1.2, Annex 1.2, section 2).

Although fishers stated preferring nets as a method it is also the most difficult method for them to gain access to. Nets are the most expensive gear (see Table 13); very few fishers own their own net. They hire the net, or own it in partnership with other fishers (mostly 5 or 6). Similarly, payment for the gear is a share of the catch (approximately 20% of the catch). This is a remuneration for the use of the gear and its maintenance. Beach seines are always owned by an individual, but not necessarily a fisherman. Similar findings were obtained in the review for Kenya (Annex 1.2, section 3), but little information on this was found during the review for Tanzania.

Other less expensive gears are owned individually. However, although fishers need masks and fins to spear fish and dive to collect lobster or sea cucumber, few use fins as they cannot afford them.

2.2.2.4. Fish prices and potential income

The price of the fish varies according to the "grade" which relates to the size of the fish and to the species. The highest prices are sought for lobster, prawns, sea cucumber and pelagic fish (see Table 14). On average, prices, when converted into GBP are lower in Tanzania than in Kenya. This could be due to more availability of fish in Tanzania, but this could also be due to exchange rates bias (Ksh being stronger than Tzsh to the pounds), or general costs including labour being lower in Tanzania than in Kenya. More investigations would need to be made to draw conclusions, in particularly in comparison to the purchase power in both countries.

Table 14: Fish prices per country and type of fish

Country	Type and grade of Fish	Price per Kg (local currency)	Price per Kg (GBP)
Kenya	Pelagic fish	100	0.8
	Demersal grade A	70-80	0.6-0.7
	Demersal grade B	50-60	0.4-0.5
	Demersal grade C	40-50	0.3-0.4
	Octopus	50	0.4
	Prawns	100-150	0.8-1.2
	Crab	90	0.75
Tanzania	Pelagics	400-700	0.26-0.45
	Demersal grade C (dagaa)	250	0.16
	Fresh sea cucumber:	1000	0.65
	Grade A	600-700	0.4-0.45
	Grade B	300	0.2
	Grade C	200	0.13
	Grade D	100	0.06
	Grade E	2000	1.3
	Prawns	7000	4.5
	Lobster	250	0.16
Octopus			

On the basis of the above prices and the catch estimated by the fishers, the daily income per fishermen can be as low as 0.4-1.6 GBP per day if fishing with traps to 4-8 GBP on a good days' net fishing. These figures compare to findings for Diani in Kenya (Rubens, 1996, King, 2000, Annex 1.2, Section 3), although are higher than those found in the review for Tanzania (where 9.5% of the artisanal fishers earn less than 0.2 GBP per day, about 35% earn around 0.9 GBP per day, and the most earned is around 4 GBP per day (Annex 1.1 section 3.3)). However catch estimated by fishers is rarely the average catch, which makes it difficult to extrapolate an income. Due to time and budget constraint it was not possible to carry out a comprehensive income survey. However relative wealth status was explored through the household surveys and are presented in section 2.3.

2.2.3. Other fisheries stakeholders

Other fisheries dependent livelihoods are fish trading, boat making, sea weed farming and ice selling (see section 1.2.2.).

2.2.3.1. Fish traders

Fish traders represent the main fisheries stakeholder group after fishers. Fish traders include fresh fish traders, fried fish traders and traders of specific marine products such as lobsters, sea cucumbers or octopus. Their activities were investigated through focus group interviews (fish fryers) and semi structured interviews for the others as their number is relatively low.

Fish fryers (Mama Karanga)

Fish frying is a very important activity for numerous households (see Table 15). On average 16 to 17% of the households depend partly on fish frying. Dependence is particularly high in Mtondia and Kondo where up to a quarter of households depend on fish frying for their livelihood. Women are the fish fryers.

Table 15: Percentage of households depending at least partly on fish frying

Chumani	Mtondia	Kidundu	Kenya sites	Kondo	Mlingotini	Tz Sites
10.7	25.7	9.6	17.3	23.4	8.7	16.5

During the low fishing season, the women also farm, weave or sell firewood. During the high fishing season however, the number of fish fryers can double. There seems to be no specific age group for fish fryers, and they are all local. It was noted through the focus groups that women who fry fish are often widows, lone mothers or have a husband who does not earn a sufficient income. When investigated further (see section 2.3), fish fryers' households did not appear poorer than other fisheries dependent households.

Fried fish traders buy fish directly on the beach from the first fishers to land their catch. They usually buy lower grade fish or dagaa, but they may also buy larger fish and cut them in pieces. Although loyal trader-fisher relation does not seem to happen often, some fish fryers try to incite fishers to sell them fish by giving them cigarettes, or to lend them money. Creating a loyalty can be very important for the traders, particularly in the low season when the catch is small. A good fisherman/trader relationship may mean that the woman gets fish whereas there is not enough for all traders. Similarly, if there is plenty of fish, traders can also get credit from the fishermen.

Fish fryers gut the fish then rush home to keep the fish as fresh as possible. They fry the small fish whole and larger fish is cut in pieces then wrapped in bundles in newspaper. They then sell it in their village, either at a market place or walking around the village. It was found

that although there is a market area in Chumani, women preferred to walk around selling their fish rather than paying tax to be able to do it from a fixed place. According to fish fryers, the best season for them is when customers have money which is during the cashew nut and mango season (September-December). Except during the cashew or mango months, it takes on average a fish fryer 2 or 3 days to sell her fish.

Fish fryers buy between 5 to 10 kg of fish during the high season and between 1 and 4 kg when they are able to (have access to some of the fish) in the low season. The fried fish is sold about 16-20 pence a bundle. Fish fryers estimate that for 5 kgs of fish bought they get a profit of 60-80 pence profit. During the high season they would make a weekly profit of 1.2 to 3.2 GBP (between 17 and 45 pence a day). In the low season their profit per week would vary between 20 pence and 50 pence (2 to 7 pence a day) depending on whether they buy fish every two or three days and how many kgs they buy.

Other fish traders (fresh fish and specialised fish traders)

Similarly to fish fryers, other fish traders buy fish and other marine products at the landing site.

Fresh fish and specialised traders are mainly men. Fresh fish is sold in the nearest town to fish shops, or else to private houses or hotels depending on the type of products. Traders usually keep the fish in cool boxes with ice. They specialise in large, good quality fish, lobsters or octopus. Fish traders, like fish fryers, try to establish loyal relationships with fishers but they feel that loyalty is often short, and there is little trust among the stakeholders. Some traders provide gear (e.g. fins and masks) on the condition that the fisher will sell them their catch exclusively, this is the case of sea cucumber traders.

Fresh fish is sold within a day, or within 2 or 3 days if the trader uses ice. They buy from 1 to 10 kgs of fresh fish in the day according to the season. According to the interview outcomes, traders' weekly income varies between 1.6 GBP (22 p per day) in the low season to 5.6 GBP (80p per day) in the high season.

In Kenyan sites, octopus traders provided a cool box at the landing site. An agent collects the octopus every two or three days and sells to a large company in Mombasa which exports it to Europe.

A few traders specialise in sea cucumber trade. The sea cucumber is boiled and dried then sold in Dar es Salaam or Mombasa (at the sites studied, specialised sea cucumber traders were only found in Tanzania). The process takes on average 7 days. The dried sea cucumbers are bought by Asian companies and exported to China.

Seaweed farmers

Attempts had been made to set up seaweed farming in one of the Kenyan sites, but this had been a failure due to the lack of market. Seaweed farming was only present in Tanzanian sites. Both Mlingotini and Kondo had seaweed farmers, but the farmers said that the activity was dying due to mismanagement. 37 people farm seaweed in Mlingotini, mostly middle aged men and women.

Seaweed farmers usually have another activity, either fishing, farming or small businesses. Seaweed farming occurs at low tide and the harvesting is at its peak from June to March when the weather is dry. Seedlings are tied on to the ropes and harvested after a month and a half. Harvesting occurs every two weeks. The seaweed is dried and cleaned before being sold to one company in Dar es Salaam.

Seaweed farmers estimated their harvest to be around 12000 kgs per year. The seaweed is sold at 150 Tzsh per Kg to an Indian company which provides them with all raw materials. The income amounts to a total of 1500 GBP per year (thus 40 GBP per farmer). Farmers rent boats during the season to access some of their farming areas.

Seaweed is not consumed locally and according to the focus group the seaweed is "used for making cosmetics, Colgate, biscuit and pharmaceuticals." However, not all were aware of what seaweed was used for.

Boat builders

Discussions were carried out with two boat builders, one in Kidundu (where 7 of them are located) and one in Mlingotini. Boats are made of a variety of woods, including mango and mvuli (African Mahogany). Trees used should be at least 20 years old. Builders make 3 to 4 boats a year that are sold at between 40 and 80 GBP. Kidundu boat builders mentioned that boat prices were kept low due to high competition. In Tanzania, the system was a bit different. Customers provide the wood and all raw material and hire the boat builder. There are 3 boat builders in Mlingotini, 2 of them come from Zanzibar. It costs the customer from 30 GBP for a 4m out rigger canoe to 250-300 GBP for a large one. According to them, there is a decrease in availability of appropriate trees.

Other fisheries stakeholders included ice sellers, but these were very few.

2.2.4. Summary

The main fisheries stakeholders include fishers, fish traders, boat builders, seaweed farmers, and ice sellers. The livelihood appraisal shows that main component of fisheries stakeholders are fishers themselves, and more than 75% of the fisheries dependent households depend at least partly on fishing itself. On average, 33% of the total households in the Kenyan sites and 55% of the households in the Tanzanian sites depended on fishing. Very little quantitative information was available in terms of proportion (see review, Annex 1.1, section 3, and Annex 1.2, section 3) but the average for Kenyan sites in percentage was slightly lower than the average of 54% found by Malleret-King (2000) in the Shimoni area.

In Kenya and Tanzania, marine fishing is mainly a small scale activity, with 90-95% of activities being undertaken by small scale artisanal fishers in Kenya and Tanzania (see Annex 1.1, section 2.2.2, Annex 1.2, section 2). The study sites focused thus on small scale fishing. Dug out canoes were the main boats used. It was found though that a high percentage (52% in Tanzania and 69% in Kenya), did not use boats, no information on this appeared in the review. However this was not examined in depth in the few studies mentioned in previous studies. This is mainly due to the lack of access to boats rather than due to choice.

Not using boats is the result of economic constraints rather than a matter of preference. The price of boats is relatively high (from 40 to 250 GBP). Boat prices discovered during the fieldwork were however on average lower than what the review suggested, particularly for dug out canoes, which were priced at around 100 GBP (Malleret-King, 1996, 2000). It is suspected that this difference is due to the different geographical focus of the previous studies. Previous studies concentrated on the south Coast, where a major problem is the lack of large enough trees to make boats. This could push the prices up.

Fisheries associated use patterns are relatively similar in both countries in relation to gear used, seasonality, location, trading patterns. The use patterns described in this study are similar to the ones described in the review (see Annex 1.1, section 2, and Annex 1.2, section 2). Fishing is mostly an inshore activity due to sea conditions and the equipment used. This was found also in the review.

The lack of access to boat and the types of boats that fishers can afford to buy force them to stay inshore. Pressure is thus high on inshore resources, which leads to overexploitation (Annex 1.1 section 2.2.5.2, and Annex 1.2, section 2) and affects their socio-economic status (see section 2.3)

The livelihood appraisal shows that a high percentage of fishing households use beach seines, and compares to McClanahan *et al.* 1996 in the Diani area in Kenya (very little other information on the proportion of gear use). This is partly due to economic constraints (it is possible to enter the fishery without owning or hiring any gear) and to choice (beach seines seem to bring a higher potential income than other gear, see table 13. This would confirm McClanahan *et al.* (1996) findings which suggest that 26% of the fishers using beach seines brought 39% of the catch.

Contrary to what the review and Malleret-King (2000) suggested, the livelihood appraisals show that traps are rarely used. Handline, nets and spears were also among the most important gear types.

Sites chosen for the livelihood appraisal were representative of the types of gear used, however as identified in the review there is a lack of reliable fisheries statistics in both Kenya and Tanzania. The only points of comparison is with data collected on the south coast of Kenya and mainly around Marine Protected Areas in Kenya (Mombasa, Diani, Shimoni area). Very little information was available on gear distribution in Kenya, but the results in the sites compare to the results of a recent study on the south coast of Kenya (Wanyionyi *et al.*, 2003). For Tanzania, information on gear distribution to district level is detailed in the 1998 and 2001 Frame Surveys and summarised in Annex 1.1. Appendix 4.

The constraints on livelihood development of fisheries dependent people are perpetuated by economic constraints. The use of unsustainable gear forced upon fishers due to economic constraints will lead to a vicious circle whereby, fishers use destructive gear which are easy to access, these increase the pressure on already overexploited resources. Resource depletion will affect negatively fishers' economic status and thus force more fishers into destructive fishery etc. Fishers livelihood development is constrained by the lack of financial access to more sustainable gear and more sea worthy boats which could reduce pressure on inshore resources. The effects of accessing more sea worthy boats would need to be investigated carefully however (see Annex 4, section 6).

Fish trading is also a small scale activity. Fish frying is an activity on which nearly 20% of the households at least partially depend. Income is low but will complement a more important source of income.

No storage or handling facilities are available for the fish traders who have to sell the fish as quick as possible. This constrains the livelihood of both the fishers and the fish traders by making them highly sensitive to price fluctuations and increasing post-harvest losses.

Income is higher for net fishers, lower for trap fishers. Fish fryers have the lowest daily income compared to other fish traders and to fishers. Seaweed farmers' income is only a complement to other activities. However these estimations are very rough and further information on relative wealth of different stakeholders is provided in section 2.3.

2.3. Poverty: measuring poverty and identifying factors influencing wealth

One of the objectives of the livelihood appraisal was to describe the link between activities and socio-economic status and identify the most vulnerable groups to loss or

mismanagement of the resources (sub-activity 5.2). This was done using food security and material style of life indicators (see below).

The results presented were obtained through the analysis of household survey data. The data was first coded and then analysed quantitatively.

Income is one of the most difficult and data intensive measures to obtain. It requires intensive studies which often do not produce adequate results (Maxwell, 1996). Indirect indicators have been increasingly developed to measure wealth, or relative wealth. In order to explore the links between socio-economic status and livelihood activities, it was decided to use two types of indirect indicator: Material Style of Life indicators which concentrate on assets owned by the household, and Food Security indicators, looking at coping strategies (strategies used by households when in crisis) and surplus (strategies used by households in case of income surplus). Both these indicators are cumulative indices and were based on local level wealth criteria (see section 2.3.1).

2.3.1. The use of indirect cumulative indicators

2.3.1.1. Material style of life indices

Material Style of Life (MSL) data give an indication of wealth across the communities. This indicator uses household items as indicators of wealth/poverty. These items are determined by community members and ranked according to the wealth status they indicate (Berkes *et al.*, 2001, Pollnac and Crawford 2000, Pomeroy *et al.*, 1997).

MSL data collected was adapted from previous studies (Pollnac and Crawford, 2000). Material style wealth criteria were investigated through interviews. Thus items taken into consideration (see table 16) in the calculation of the MSL score are based on local specific criteria (as perceived by communities). These items were similar in all study sites. Items considered were: housing (roof and wall material) and their condition (bad to good), livestock (type of livestock owned), ownership of transport (type of transport), access to water (from public to private wells). The higher the score, the wealthier the household is (see table 16).

Items were ranked according to wealth/poverty by informants. The MSL score is obtained by adding the score of each item. Although items identified as showing wealth/poverty did not vary across the study sites, the ranking varied slightly between Tanzanian and Kenyan sites on the access to water (see Questionnaires, Appendix 2).

Households could own several houses, in which case each house was given a score by the interviewer according to the predefined criteria (see Table 16). The interviewers noted the number of houses with each identified item (wall material and roofing) and an average house score was determined for each household. This average score was then added to the score obtained by the other items.

Table 16: Components of the households MSL index

Walls	Score	Number houses	Roofs	Score	Number houses
No house	0		No roof	0	
Thatch bad condition	1		Thatch (bad cond.)	1	
Thatch good condition	2		Thatch good	2	
Mud bad condition	3		Corr.iron bad	3	
Mud good condition	4		Corr. iron good	4	
Stones (partial)	5		Asbestos	5	
Stones (all the house)	6				
Coral blocks (partial)	7				
Coral blocks (all)	8				
Plaster and paint (partial)	9				
Plaster and paint (all)	10				

Livestock	Score
None	0
Chicken/duck	1
Goat	2
Cows	3

Transport	Score
None	0
Bicycle	1
Car	2

Access to water	Score
River/ public well/free	0
Buy water	1
Storage tank	2
Private tap	3
Private borehole	4

2.3.1.2. Food security indices

To refine the analysis on poverty, food security indices were also used. MSL data reflected the long term situation of the households (assets taken into consideration correspond to relatively important investments which are often made over time). Household food security indicators give information on the short term socio-economic status of households.

Household food security is *'that state of affairs where all people at all times have physical and economic access to adequate, safe and nutritious food for all household members, without undue risk of losing such access'* (FAO 1996). Food coping strategies, which are *'short term temporary responses to declining food entitlements'* (Davies, 1993) and are widely used socio-economic indicators, are believed to be a good measure of food security.

Households, when facing a crisis, use a succession of coping strategies in order to stay food secure and to maintain their livelihood systems (Swift 1989; Davies 1993; Nyborg and Haug 1995, see Appendix 3). Coping strategies can provide a good indication of household vulnerability (Nyborg and Haug 1995; Maxwell 1996). For example, Maxwell (1996) used an analysis of food coping strategies to show that households cultivating urban gardens in Kampala were more food secure than households which did not. Similarly Malleret-King, found that fishers were the least food secure user group in the vicinity of an MPA in Kenya (Malleret-King, 2000).

In this study two food security indices were used, a food coping strategy index (FCS) and a short term food surplus index (FS). The surplus index was used as it was found by Malleret-King (2000) to be one of the most useful indices, particularly in discriminating between households in non-crisis situation.

Coping strategies identified at the sites included changing diet, skipping meals, borrowing money or food. These were ranked by informants according to their severity (1 the most severe to 4 the least severe). All sites had similar ranking and strategies (see questionnaires in Appendix 2). In times of surplus, diet improvements were identified as wealth criteria, from eating maize meal to eating pilau which is a traditional dish of rice, meat/fish and spices usually cooked for very special occasions. The ranking of food surplus strategies differed in Kenya and Tanzania (see questionnaires in Appendix 2).

A frequency scale was then determined with the informants in order to identify how frequently each strategy was used (over the whole year). Thus the more the households used severe coping strategies, the more vulnerable. The more a household eats foods identified as "wealthy", the wealthier the household. Frequencies varied from more than once a week to never (see Table 17).

Table 17: Coping/strategies, ranking and frequency scale (Kenya)

Strategies in times of crisis	Severity rank	Frequency scale	Weight
Eat porridge	4	More than once a week	1
Skip one meal	3	Once a week	2
Borrow food/money	2	Twice a month	3
Skip all meals	1	Once 1 or 2 months	4
		Once to five times a year	5
		Never	6

In times of surplus

Surplus strategies	Rank (best: 6)	Frequency scale	Weight
Eat maize	1	More than once a week	6
Eat rice	2	Once a week	5
Eat meat	3	Twice a month	4
Eat fish	4	Once 1 or 2 months	3
Eat chapatti	5	Once to five times a year	2
Eat pilau	6	Never	1

The indices are calculated by weighting the frequency of use of identified strategies by their perceived severity rank (Equation 1):

$$I = \sum_{i=1}^{i=n} F_i R_i \quad (1)$$

where I= index (FCS, FS), i = strategy number, R: severity rank of strategy i, F = frequency of use of strategy i, n= total number of strategies investigated.

The higher the score the more food secure the household.

2.3.1.3. Analysis

The scores MSL, FCS and FS indices were analysed separately and as a cumulative wealth score (MSL+FCS+FS). The MSL reflected the longer term situation of the household whereas the FCS and the FS reflect the short term status. The livelihood appraisal aimed at identifying the most vulnerable user groups, and exploring the link between activities and socio-economic status.

Furthermore the interest of the project is fisheries dependent people. Thus the analysis concentrated on general factors potentially affecting wealth (demographic, geographical, economic activities) and investigated in more detail fisheries associated factors (fisheries related activities, fishing systems-boat and gear use).

ANOVAs and t-tests were used to detect significant potential differences according to location, demography and general activities using the household survey data.

Pearson correlations were also used to investigate the variation of the scores according to fisheries activities and gear use. To do this the data was aggregated at the community level and both occupational structure and household survey data were used. This was done in order to investigate the potential variation of scores according to specific gear (including beach seines). As mentioned in previous sections, it was necessary to combine both data as household survey results were not specific enough in relation to the gear used, particularly nets.

The statistical analysis was carried out using Excel and Systat softwares.

2.3.2. Results

2.3.2.1. Factors

The links between scores and activities were investigated at different levels: according to the main source of food, to the main source of income, whether activities were fisheries or non fisheries associated. For fisheries dependent households, the variation of wealth according to different types of fisheries associated activities were investigated. For fishing households, whether they owned a boat or not and if they owned a boat what type of boats they owned was investigated (see Table 18).

Table 18: Factors taken into consideration for the different types of households

Factors	All households	Fisheries dependent households	Fishing dependent households
Location	village, country	Village , country	Village, country
Main Activity	Food, income, fisheries/non fisheries,	Type of fisheries dependent activity, country, village,	
Fishing system components			Gear, boat ownership, boat use, type of boat owned

The tables below present significant results. Links were considered significant for $p < 0.05$.

2.3.2.2. Analysis of Variance and t-test results

Table 19 summarises the significant variations found between socio-economic status and the different factors explored.

Table 19: Significant variations between socio-economic status and different factors

Factors	MSL			FCS			FS			Wealth Score		
	N	F	p	N	F	p	N	F	p	N	F	p
Country	231	32.4	0.00	NS			232	7.4	0.01	229	5.5	0.02
Village	231	9	0.00	232	13.8	0.0	232	20.9	0.0	229	4	0.00
Type of boat owned	112	6.5	0.001	NS			NS			NS		

Ttest

Factors	MSL			FCS			FS			Wealth Score		
	N	t	p	N	tF	p	N	t	p	N	t	p
Fishing households /country		-3.9	0.00	NS				-4.6	0.00		-3.6	0.001
Boat use		-2.0	0.04	NS			111	-3.3	0.02	NS		
Boat ownership	NS			NS			113	-2.1	0.04	NS		

2.3.2.3. Results at the general level

Significant differences were found across the villages for all indices. On average Mlingotini and Kondo are wealthier than other villages, the least wealthy overall is Kidundu (see Table 20 and Table 21).

Table 20: Average scores for the villages

Location	MSL	FCS	FS	Wealth score
Chumani	10.8	44.1	57.8	111.5
Kidundu	10.5	29.4	63.0	103.2
Mtondia	9.6	26.8	79.2	113.7
Kenya	10.3	33.2	67.9	108.6
Kondo	13.2	30.3	72.8	118.2
Mlingotini	14.5	35.5	78.8	130.4
Tanzania	13.9	33.2	75.8	125.1

Table 21: Scores ranked from 1 (wealthier or most food secure) to 5 the least.

Villages	MSL	FCS	FS	Wealth score
Chumani	3	1	5	4
Kidundu	4	4	4	5
Mtondia	5	5	1	3
Kondo	2	3	3	2
Mlingotini	1	2	2	1

2.3.2.4. Results concerning fisheries dependent households specifically

When the situation of fishing households was investigated further, it was found that, on average, fishing households are poorer in Kenya than in Tanzania. All indices except for the food coping strategy index are significantly lower in the Kenyan sites (Table 22). Country based differences were not found for other fisheries dependent associated livelihoods.

Table 22: Fishing households' score averaged per country

Location	MSL	FCS	FS	Wealth Score
Fishers Kenya	10	-	65.3	108.6
Fisher Tanzania	13.6	-	78.2	125.9

Similar use patterns, gear and boats were found in both countries (see section 2.2). This result could suggest that the resource base is still in better condition in Tanzania than in Kenya.

However, t-test showed that there are significant differences in MSL and FS scores according to whether a fishing dependent household uses boats or not. Boat use is linked to higher MSL and higher food surplus scores (11.8 against 10.1 and 72 against 62) (Table 23).

Table 23: Average scores for fishing households using boats and those not using boats

Boat use	MSL	FCS	FS	Wealth score
Yes	11.8	-	72	-
No	10.1	-	62	-

Results presented in section 2.2 suggested that more households used boats on average in Tanzania than in Kenya. The Pearson Chi-squared test suggest that the use of boats is significantly higher in Tanzania ($p < 0.01$). Thus boat use could be a factor contributing to the higher food security scores obtained by the fishing households in Tanzania than in Kenya.

Significant MSL variations were found according to boat ownership and the type of boat owned. Fishers not owning a boat were the least wealthy in terms of material items. The more expensive the boat the higher the MSL score. Thus fishing households owning a dug out canoe were the poorest of the boat owners and dhow owners are the wealthier (see Table 24).

Table 24: Averaged scores according to the type of boat owned by fishing households

Boat ownership	MSL	FCS	FS	Wealth scores
None	10.5 (76)	-	-	-
Canoe	12.1 (28)	-	-	-
Outrigger	17.1 (7)	-	-	-
Dhow	18 (1)	-	-	-

2.3.2.5. Results of Pearson's correlations: links between gear used and wealth

To investigate the relationship between wealth and gear use, Pearson correlations were used. Bonferroni probabilities were used to detect the significance of the correlation ($p < 0.05$). For the purpose of this analysis the gears were aggregated into 5 categories: collection/diving/speargun handline, traps, nets, beach seines, cast nets. The data was aggregated at the village level (percentages). Table 25 presents the significant correlations detected.

Table 25: Significant correlations between wealth of fishing households and gear use

	FS
Beach seine	0.93

The only significant link found was between beach seines and food surplus. The more beach seines are used, the more food surplus (see Table 25) is available.

These results are in line with the results presented in section 2.2 where the potential income were investigated according to the catch. Beach seiners were would get the highest income. The results above could show that fishers are right to aspire to enter beach seine crews.

2.3.3. Summary

One of the aims of the livelihood appraisal was to detect whether links existed between the different activities at the community level and wealth. No significant relationships were found between economic activity and socio-economic status at a community level. Similarly, no significant relationship was found between the socio-economic status and the type of fisheries associated livelihood. This does not confirm/infirm results found in the review in Kenya (fishers were identified as one of the poorer groups in Shimoni area) or results found in Tanzania where it is suggested that fishers are better off than farmers.

However, fishing households were found to be wealthier in Tanzania than in Kenya. This could be due to the fact that more fishers use boats in Tanzania than in Kenya. Analysis done to compare how gear affected fishers' wealth showed that beach seine contribute positively to the food security of the villages. However these results need to be interpreted cautiously as both the household survey data (averaged scores) and the occupational structure data (percentage of households using each gear in the different villages) were used which might cause discrepancies in these results. Also, beach seine can be only a short-term benefit, leading to overfishing.

Fisheries dependent households, particularly fishing households not using boats and not owning boats are the poorest fishing households in terms of MSL and FS. They will thus be the most vulnerable to loss or mismanagement of fisheries resources.

Table 26: Summary of poorest households according to the different factors, sign of contribution of gear to wealth

	MSL	FCS	FS	Wealth score
Country (all households)	Kenya	ns	Kenya	Kenya
Country (Fishing households)	Kenya	Kenya	Kenya	Kenya
Boat use	No use	ns	No use	ns
Boat ownership	None, canoe	ns	ns	ns
Beach seine	ns	ns	+	ns

The results above can be compared to the results obtained by Malleret-King (2000) study in terms of the importance of the use of a boat for food security and longer term wealth. The use of boats enable fishers to access more distant productive or less exploited fishing grounds. The impossibility to use boats due to the lack of finance for is thus a constraint to fishers' livelihood development.

The type of boats owned was also found to affect wealth, the more expensive the boat owned, the wealthier in the long term. However the cause effect relationship might not be straight-forward. Ownership of more expensive boats might be the result of longer term wealth, whether caused by fishing with these boats or not.

2.4. Resource governance at the local level

The existence of formal and informal institutions relating to fisheries resource management was investigated. Table 27 summarises the management institutions found at the local level and their role. Fisheries management was found to be mainly the activity of formal institutions.

Table 27: Formal institutions acting at the local level, role as perceived by stakeholders

Kenyan Institutions	Type	Role
Department of Fisheries	Govt. Formal institution	Provide fishing licences including for visiting fishers. Provide licences for fish traders.
Beach Management Committee	Formalised institution (inactive in the 3 sites)	Prevent the use of illegal gears, help enforce fisheries law.
Samaki Youth Group (Chumani) Mtondia Fishermen Group	Registered group (inactive)	Mtondia fishermen and fish fryers set up this group to provide more modern equipment to fishers and open a fish shop to help traders/fishers and contribute to reducing malnutrition. Revolving fund.
Tanzanian Institutions		
Fisheries Division	Govt. Institution	Provide licences and authorization to fish and trade Fee collection for selling fish in Dar.
Environment Management Committee	Govt. Institution at local level	Control of the use of illegal gear Prevent/control of mangrove and wood cutting
Fishermen committee (Mlingotini)	Community group	Mediation between fishers and government (lobby group). Prevent illegal fishing.
Kitunze Women Group	Community group	Establish a revolving fund

2.4.1. Formal institutions and their limits

In Kenya, the Fisheries Department's main role is perceived as granting fishing and trading licences and preventing the use of illegal gears. In Tanzania, the main roles of the Fisheries Department was perceived as granting licences and producing statistics. In Tanzania, the relationship between fishers and Fisheries Division did not seem to be as antagonistic and tense as in Kenya. This was despite Mlingotini fishers in Tanzania having created a group to defend themselves against Fisheries Division after a raid was carried out on illegal gear. The government at the time was considered heavy handed. The idea of the group was that representatives would go to forums and discuss the rights of fishermen. However this has not yet occurred.

Discussions with the focus groups and Fisheries Department personnel confirm what was suggested in the review. The Fisheries Department is not in a position to enforce the Fisheries Act as it stands. One of the main comments of the stakeholders was that the law was not enforced. Two out of the three villages studied in Kenya complained that they had no interaction with the Fisheries Department, as Fisheries Officers did not come to their area. Some even mentioned that if Fisheries Officers came they did not come to enforce the law, but were open to bribes, which perpetuated the use of illegal and destructive gear at the sites.

Because of the lack of fisheries law enforcement, fishers and traders (who also need a licence to trade from the Fisheries Department) admitted not having licences. This was particularly the case of the furthest villages from the town, Chumani and Kidundu. Although the access to Kidundu is difficult, access to Chumani is not difficult, it thus surprising that the Fisheries Department personnel did not go there more often. When discussed with the Fisheries Officers, they denied this and said they were regularly going to Chumani but not to Kidundu as the Fisheries Department's boat was under repair.

Beach Management Committees (BMC) were mentioned by all focus groups in Kenya as important local institutions, the role of which was perceived by members of the focus group to be to prevent the use of illegal gear. However, in the three study sites the BMCs were inactive. Mtondia BMC was dissolved in early 2002 due to divergent opinions of its members on the use of beach seines. Furthermore, when BMC members were interviewed about their role and their feeling about the BMC system, some complained that their task was time consuming and that they were not paid. Although the BMC is a formal institution based on a traditional management body that comprised beach leaders, it does not have the same powers. For example, the beach leader used to decide whether outsiders could fish in the village's fishing grounds. It is not the case anymore, outsiders do not need to consult local fishers but just need to get an authorisation from the Fisheries Department. This has caused resentment and conflicts in the Kenyan sites when foreigners were given permission to fish with gears not approved by local fishers (e.g. beach seines) and were illegal.

In the Tanzanian sites, Environment Management Committees (EMCs) were found to have a similar role to the BMCs in Kenya. It is worth noting that there was no mention of the Fisheries Division's initiative to establish Beach Management Units (similar to BMCs in Kenya), which has been undertaken along the coast over the past year following experiences from Lake Victoria. The EMC has a wider mandate than the BMC, however, as its role is not only to prevent the use of illegal gears, but also to prevent the illegal use of resources such as mangrove. It is perceived by the communities as a government body and is resented by the fish fryers who feel that the EMC prevents them carrying out their activity by prohibiting mangrove cutting (they sell it and use it to fry their fish). However, EMCs, like BMCs, are not really operational, and they lack the means with which to control the use of illegal gears.

2.4.2. Community groups

Only two community groups were found in the sites; a new group in Mtondia, and a non-functioning group in Chumani. No cooperatives, fishermen's committees or groups had been created to improve resource management through regulating fishing/fisheries related practices. The main reason for this in Kenya is believed to be the distrust among stakeholders (Annex 1.2, section 4). In Tanzania, the Village Environment Management Committee is responsible for the management of the marine resources as well as other environmental concerns, but weak due to limited resources. The Fisheries Division intends to strengthen the conservation activities by establishing Beach Management Units (Annex 1.1, section 5). This may explain the lack of community groups in Tanzania.

2.4.3. Informal, traditional governance, ethics in the main dependent activities

It was believed that traditional practices or beliefs preventing the use of some resources in some areas at certain times of the year could contribute to fisheries resource management.

However, all fishing focus groups in Kenya denied the existence of any form of traditional/informal fisheries management (see interview guide in Appendix 1). According to them taboos, used to exist but are not respected any more. These taboos had related mainly to sacred areas where fishing was prohibited. In Tanzania, no-one mentioned taboos. Focus groups in Tanzania emphasised the fact that the fisheries were managed by the government.

Informal rules exist, however, among fishers. These relate mainly to gear conflict avoidance (e.g. not disturbing an area where nets are set, not passing with boats on top of nets, spear fishers not targeting fish in traps) or safety (e.g. spear gunners should be in pairs, the fisher should wait until the other fisher has come up before shooting). The only user group who had informal rules which may affect the sustainability of the resources were the crab fishers. One of their rules is that a fisher must not destroy or alter crab holes when looking for crab or cut mangroves. This could contribute to habitat protection. Otherwise none of the rules mentioned by the fishers were likely to affect the resources.

However, when the situation gets desperate, the community can have power in terms of management. This is shown by the way Chumani fishers took matters in hand in view of the lack of cooperation of the Fisheries Department and chased beach seiners away. This was a one off action. Similar action was carried out in the Diani area (see King, 2000).

In the case of fish traders, rules related more to marketing and hygiene than to the resources. Fish fryers commit to the use of fresh oil, clean wrapping paper, and frying the fish as quickly as possible. Informal rules mentioned by fresh fish traders were related to protecting their business (e.g. in Kidundu fish traders agreed to make sure outsiders could not enter the trade by dropping prices if one tried to make business). However this unity amongst traders did not last long according to the traders.

None of the groups mentioned closed areas or closed fishing periods. Fishers fished 6 days a week on average. Their day's rest is determined by religious practices. As described in section 2.2 on use patterns, fishing pressure is only reduced during the rainy season, when the water is rough and farming is at its peak.

2.4.4. Summary

Governance at the local level is perceived to be mainly the role of formal institutions. No traditional forms of management were detected. However, even though formal institutions such as BMC, EMC or Fisheries Departments were mentioned as the most important institutions in resource management at the local level, stakeholders also perceived that

these institutions did not function well and that there was a lack of governance. This is one of the main constraints to their livelihood development as it is allowing destructive methods to be increasingly used, depleting further the resources. This constraint was also identified by the stakeholders themselves (see section 2.5).

The lack of community initiatives was also noticed and confirmed the review findings (Annex 1.1, section 5.1.2 and Annex 1.2, section 3) that very few self help groups existed in the communities. The lack of self help groups is believed to prevent local stakeholders to access equipment, as well as preventing them to contributing to improving the management of the fisheries resources, this constrains their livelihood development.

Although there is limited community initiative taken to fill the lack of fisheries management, in some instances communities can work together. Examples of local enforcement exist in Kenya, where fishers have chased out destructive fishermen. This has happened in Chumani and Diani-Galu areas (King, 2000), where local communities chased out fishers from other areas.

2.5. Livelihood constraints perceived by the main stakeholders

2.5.1. Constraints/problems identified by fishers and traders

The main livelihood constraints and problems were discussed during the focus groups and semi-structured interviews (see Appendix 1). Livelihood constraints and problems perceived by the main fisheries stakeholders (fishers and traders) related to three aspects: the resource, the access to capital and the lack of management.

2.5.1.1. Resource related constraints

All groups (fishers and traders) except one had perceived a decline in the fisheries resources. Both the quantity and the size of fish have decreased according to them. Fish fryers emphasised the fact that "before", they could cut larger fish in four pieces, and now they cannot. According to fishers some species have particularly been hit (octopus in Chumani, mullet, snappers in the Kidundu, prawns in Kondo). Questions were asked to understand whether this was a seasonal factor, but all groups mentioned that the decline was noticed in all seasons. Although not explicitly asked, it assumed that this perceived decline relates to inshore resources, probably within an hour or so of the landing sites, as this is the approximate maximum reach of the boats used.

According to the stakeholders the was decline due to:

- The use of destructive gear such as beach seine (beach seine fishers have been chased away by fishers themselves in Chumani as this was not done by the authorities), the increasing use of poison, malpractice when collecting crabs, the destruction of mangroves.
- El Nino heavy rains, increase in the sea urchin population and mantis shrimp outbreaks (links are unclear, but this has been a phenomenon in the Western Indian ocean in the last few years - mentioned by fishers in Chumani),
- An increase in the number of fishers. This is mentioned by all fisher focus groups. According to the Tanzanian stakeholders, the increase of the number of fishers is due the change in the political system. For them, current government policies have led to a drop in employment alternatives in the coastal areas, thus a high number of people have entered the fishery in the last 20 yrs.

All these reasons interact with each other, and often the cause-effect link is difficult to identify. Thus for example increase of the sea urchin population is mainly an effect of overfishing (McClanahan, 2001). However urchins in sufficient numbers will compete with some herbivorous fish species.

2.5.1.2. Constraints related to access to financing

Access to finances is considered limited and insufficient. There were no cooperatives at the sites, and only one of the community groups that was set up to establish a revolving fund is still active. It is a new group (see Table 27). This supports the findings of the review (Annex 1.1, section 4.3.1 and Annex 1.2, section 3).

Lack of ability to purchase fishing equipment

According to fisheries stakeholders, one of the most important constraints to their livelihood development related to their ability to purchase fishing gear and boats to support fishing activities. All user groups stressed the lack of equipment as a main constraint. Fishers emphasised the lack of higher-powered and more sea-worthy boats, as well as the lack of more modern gears that would allow them to fish outside the lagoon more effectively.

Although it is obvious that because of the lack of access to better and more sea worthy boats, fishing is concentrated in the lagoon thus the pressure on the reef fishery is high in both countries, the lack of information on the available offshore resource does mean that there is uncertainty that the resource would be able to support an increasing offshore artisanal fishery.

Lack of infrastructure

The lack of storage facilities was also underlined as a constraint by both fishers and traders. The lack of cold storage means that both fishers and traders have to sell their product as fast as possible, thus at very low prices when the catch is good. Fish has to be sold quickly and often outside the villages where freezers are available.

According to the fishers, the lack of access to finances has also led to an increase in the use of destructive gears such as beach seines or poison. Stakeholders, although admitting that beach seines are one of the main causes for the decline in the fish resources, will still join a beach seine crew as it is the easiest and cheapest way to enter the fishery.

Price fluctuations and incapacity to organise themselves is one of the problems evoked by the traders, as well as fishers.

Other problems mentioned included health problems (fish fryers complained of chest pains resulting from the smoke from the frying), and the heavy levy for trading (fish fryers from Kondo).

Some local solutions to the lack of access to finances

Although fishers complain about the lack of access to finances, arrangements are made within the community to alleviate this constraint. Thus expensive gears, such as gill nets and boats, are owned by groups of fishers rather than individuals. Fishers, when necessary, can pool funds together. Furthermore, it was discovered that arrangements are made between fishers and traders. Traders of specific marine products will provide gear or storage facilities. This is the case, for example, for sea cucumber and octopus traders. However, in the case of octopus buyers, the arrangement is biased as gear and/or storage facilities are provided, but prices are kept low as there are very few octopus agents.

Besides gear being provided by traders to fishers, credit arrangements are also made. Some traders, in order to develop a good relationship with their providers, will grant them

loans. Fishers may also give credit to some traders. However, traders were complaining that often due to poverty and despair, loyalty was rare. Often fishers would sell to someone else even if they had an agreement.

2.5.1.3. Constraints related to governance

Interestingly, all fisher focus groups mentioned that one of the major problems in the fishery was the use of illegal gears, such as beach seines and poison in both countries, and dynamite fishing in Tanzania. For them, the way the resource is exploited currently has led to the decline of the resource in the main fishing grounds. For the stakeholders, this overexploitation is also due to the lack of fisheries management by government institutions. For fishermen, the Fisheries Department and other institutions are also responsible for the overexploitation of the resources as they do not enforce the prohibition of the use of illegal gear. The lack of proper management was identified as a constraint in the review (Annex 1.1, section 5 and Annex 1.2, and section 4).

However, if the Fisheries Departments were effectively enforcing the law, a number of stakeholders would lose their most important livelihood activity because beach seining is used by more than a quarter of the fishing households in the selected sites as shown by this study (see section 2.22.2.) and spear guns, now illegal in Kenya are used by more than 70% of the fishers in Chumani.

2.5.2. Constraints identified by other stakeholders

The main complaint of the seaweed farmers is the low price. There is only one outlet for their product, thus the price is kept low by the buyer. Other constraints mentioned were diseases affecting seaweed, and also fishermen stealing their rope.

Constraints identified by boat builders were the increasing difficulty to find appropriate wood, and the lack of organisation amongst boat builders, which made boat prices collapse.

2.5.3. Summary

The constraints detailed above were identified by the stakeholders themselves.

Stakeholders have perceived a decrease in the resources in all sites. They attribute this drop in catch to the excess of fishers, to the use of destructive gear but also to "ecological" factors they have identified, including El Nino, outbreaks of sea urchins and mantis shrimps. It is interesting to note that fishermen consider these ecological factors to be a cause rather than an effect of resource overexploitation. However, the most constraining problem for them is the lack of access to credit, which forces fishers to use boats and gear which constrains them to fishing inshore and putting extreme pressure on the lagoon, thus constraining their livelihood development by depleting the resource base. This lack of access to capital is also one reason for them why destructive gear is widely used, contributing to the unsustainable use of the resource. Finally, the lack of management and enforcement from the responsible authorities and the lack of initiative by fishers to manage their resource contributes to exacerbating this trend.

Key constraints to the livelihood development, identified by the fisheries dependent people are therefore:

- Lack of effective management
- Resource depletion in inshore areas accessible to fishers, due to lack of management (illegal gears), population pressure, and environmental effects

- Lack of access to credit to enable fisheries to move beyond inshore areas (but note, offshore potential needs to be established, access could exacerbate inshore resource depletion).

3. Conclusion: constraints on fisheries livelihood development

3.1. Links between the stakeholders and their resources

The findings referred to below relate to sub-activities 3.1, 5.1, the aims of which were to identify stakeholders and describe the relationship between fishers and their resources.

3.1.1. Stakeholders

Although community fisheries stakeholders include fish traders, artisanal fishers (local and migrant), trap makers, boat builders and ice sellers, the main, most numerous fisheries stakeholders at the sites were local fishers and fish traders, particularly fish fryers. They will constitute the larger group threatened by the loss of mismanagement of fisheries. The livelihood analysis has identified groups within these two groups that are more vulnerable (see next section).

The stakeholders analysis also identified the scarcity of self help groups related to fisheries, explained by the high mistrust among community members. This is found is one of the main constraints to livelihood development (reducing access to credit, see section 3.4)

3.1.2. Dependence on fisheries resources and its implications

Dependence at the community level on fisheries resources in the representative sites varied between 30 and 71% of the households, with a higher average dependence on the Tanzanian coast (68%) than on the Kenyan coast (43%). From the household surveys, it was found that the proportion of fisheries dependent households depending on fishing were equivalent in Kenya (75%) and Tanzania (77%). These households also depend on other activities such as farming or small business for their livelihoods, which would suggest that fisheries dependent households would not be as vulnerable as expected to fisheries resources loss or mismanagement.

However, more detailed investigations showed that, in Tanzania, for most of the fisheries dependent households (fishing households) fishing was the main or only source of income (56% of fishing households depend a 100% on fishing for their income). In Kenya, this proportion was much lower (8.3%).

Thus although fisheries dependent households spread their risks and have an array of activities to provide income and food, loss or mismanagement of fisheries resources would highly affect 43% of the households on the Kenyan coast and as much as 69% on the Tanzanian coast with a high percentage depending solely on fisheries for income. The depletion of fisheries resources would be the loss of the only source of income of more than half of the fishing households for the Tanzanian coast and the loss of the main source of income for more than 68% of fishing households in both countries. This in a situation where there is an increasing dependence on monetary income for living, households are not self sufficient and although they used to produce enough foodstuff for their survival this is not the case any more due to the lack of land, decreasing soil fertility, and the collapse of more effective traditional farming systems (Malleret-King, 1996, 2000, King, 2000)

The loss and mismanagement of fisheries resources would affect not only fisheries dependent household but the wider community as both fisheries and non fisheries

dependent households depend highly on fish for food (more than 70% of fisheries dependent households eat fish at least once a week and more than 50% of non fisheries dependent households). The loss or mismanagement of fisheries resources would deprive a high percentage of households of their income and of access to cheap animal protein. Resource depletion triggers an increase in prices, which is already felt during the low fishing season.

3.1.3. Findings on resource use patterns and their implications

Fishing which is the most important livelihood activity at the coast (more than one third of households on average in Kenyan sites depended on fishing and more than two thirds of the households in Tanzanian sites) and is a small scale activity. Small non powered boats are used and a large percentage of fishers do not use boats (more than 50% in Kenyan and Tanzanian sites). Handlines are used widely but non traditional gears such as nets and spearguns are the most widely used overall, particularly beach seines.

In contradiction with what was suggested in the review, particularly for Kenya, traditional traps were not found to be widely used. Traps were rare in all the study sites. Other studies suggest that basket traps are still widely used. Studies from which the review information was extracted in Kenya concentrated on areas where Marine Protected Areas had been established and where fishing occurred in Marine Reserves (McClanahan, 2001, Malleret-King, 2000, King, 2000). This introduces two biases from the fisheries point of view. Firstly, only certain types of fishing are allowed in Kenyan Marine Reserves; spear and beach seine fishing is prohibited and largely enforced. Furthermore, Marine Protected Areas are connected to tourism developments. Even when studies concentrated on areas where no MPA was established there was high tourism development (Malleret-King, 1996, Rubens, 1996). The presence of tourism development may mean that the younger generation has more employment opportunities outside the fishery, thus the proportion of elder fishers could be larger than in the representative sites selected and since traps are the elders' favoured gear, their proportion would be larger than in the sites selected for this study. However, this would need further investigation.

It came out from discussion with fishers that the low use of boats and better gear was often determined by economic constraints. Boats are often not accessible due to their price. Fishers share them or don't use them; few own them. Furthermore, these boats are not highly sea worthy which prevents fishers from going offshore. Expensive gear, such as nets, are hired or shared. The lack of difficulty to afford expensive equipment, which was identified as a main constraint to their livelihood development by the fishers themselves, means that effective yet illegal and destructive gear such as beach seines are favoured, and that activities are often confined to the lagoon area. Economic constraints reinforce the attraction of beach seine which provides a high catch (as perceived by fishers themselves, see section 2.5, confirming review findings Annex 1.2., section 2- McClanahan *et al.* 1996) but deplete the resources (as perceived by the fishers, see section 2.5, and from review findings, Annex 1.2, section 2 McClanahan *et al.* 1996, McClanahan and Mangi, 2001).

The economic constraints that affect fishers resource use patterns (types of boat used and of gear used) are contributing to the overexploitation of the inshore fisheries, thus putting at threat the livelihoods of a high percentage of households in the communities (see section 3.1.2). The resource has been perceived as declining by the fishers and fish traders as well as by research studies in various areas in Kenya and Tanzania (see Annex 1.1, section 3 and Annex 1.2, section 2).

Finally, fish traders buy the fish directly from the landing point and sell it as quickly as possible due to the lack of storage facilities. The lack of storage facilities, due to the lack of access to credit makes both the fish traders and fishers sensitive to price fluctuations by forcing them to sell when the catch is plenty.

3.2. Findings on factors affecting socio-economic status of fisheries stakeholders and implications

The findings summarised below relate to sub-activity 5.3. which aim was to describe the links between livelihood strategies and relative socio-economic status, and identify the most vulnerable groups to loss or mismanagement of fisheries resources.

Investigations were carried out in order to detect whether differences in wealth (measured in terms of food security and material style of life data) between fisheries dependent households and others. No significant differences were found whereas the review results showed that fishers were poorer than other user groups in the Shimoni area (Annex 1.2. section 3) and that in Tanzania, fishing households were better off than households depending solely on farming (Annex 1.1, section 3.3).

However significant differences were found between countries, households were wealthier in Tanzania than in Kenya sites, particularly fishing dependent households were wealthier in Tanzania sites on average than in Kenyan sites. This differences could be due to the fact that around Bagamoyo area, the reef is patchy and enables an easier access to the deeper richer waters (Obura, *pers. comm.*). It could also be that although overexploited, the resources in Bagamoyo are still healthier than in the Kilifi area. This would need more investigation.

Furthermore, it was found that fishing dependent households not using boats were significantly poorer than other fishing households to unsustainable use of fisheries resources and were found to be poorer than fishing households using boats. This confirms other findings mentioned in the review (Annex 1.2, section 3, Malleret-King, 2000). Similarly, ownership and the type of boat owned were found to affect fishing households, the more capital intensive the boat, the wealthier the household in the longer term (MSL).

The high dependence on fishing and the fact that fishing households not using boats are poorer than other fishing household tends to reinforce the fact that the inability to access sea worthy boats constitutes a strong constraint on fisheries dependent livelihood development. This, not only through the overexploitation it leads to inshore but also by the impossibility to access richer, less exploited fishing grounds.

3.3. Management of fisheries resources and implications

The findings referred to in this section relate to sub-activity 5.3 aiming at identifying site-specific formal and informal management systems and institutions. The management of fisheries resources was found to be the fact of formal institutions mainly, traditional management if it existed has lost its power and informal/traditional rules left relate more to hygiene and safety than to management of the resources. These findings confirm review findings (Annex 1.1, section 5.1.1 and Annex 1.2, section 4). The local stakeholders consider management of fisheries resources to be the responsibility of national institutions, particularly the Fisheries Department/Division. Management is therefore a top down affair, even though efforts are made to increase the role of the local level in fisheries management through Beach Management Units and Village Environmental Committees in Tanzania (along with the national decentralisation process), and in Kenya with the Beach Management Committees which are not yet functional. Furthermore, the Fisheries Departments/Division are not felt to carry out their mandate. However, the gap in management is not being filled by community based management initiatives. The livelihood appraisal confirmed the review findings (Annex 1.1, section and Annex 1.2, section 3), and shows that fisheries related community groups are very scarce.

No or weak management by national institutions, a top down approach, the lack of involvement at the community level and the lack of initiatives by the community themselves results in no/or very little management at the local level. This contributes to perpetuating the use of illegal gear and thus to exacerbating the unsustainable use of overexploited resources. The little amount of community initiatives might be the result of the lack of empowerment at the local level through historical reasons (King, 2000, Annex 1.2, section 4). Mistrust between community members was mentioned as a cause for the lack of community groups. It was shown that driven community members can work together when perceiving the situation desperate (e.g. in Chumani and Diani-King (2000)- when beach seiners were banned).

3.4. Constraints to fisheries dependent livelihood development

Constraints to livelihood development were both identified through investigating these constraints with the stakeholders themselves (see section 2.5) and through the analysis of the results presented above.

The main constraints identified by the stakeholders on livelihood development were:

- Lack of effective management
- Resource depletion in inshore areas accessible to fishers, due to lack of management (illegal gears), population pressure, and environmental effects
- Lack of access to credit to enable fisheries to move beyond inshore areas (but note, offshore potential needs to be established, access could exacerbate inshore resource depletion).

These relate closely to the findings of the livelihood appraisal analysis.

The results of the livelihood appraisal suggest that the resource is unsustainably exploited and this threatens the livelihood of a high percentage of community members, it threatens the source of income of fisheries dependent households and might threaten the food security of both fisheries and non fisheries dependent households.

The high pressure on resources is due to high dependence on fisheries resources for income at the community level (see section 2.1), probably due to the lack of alternative sources of income. It is also due to the concentration of activities in inshore areas and to the use of destructive gear (see section 2.2).

One of the central constraints to fisheries dependent livelihood development is the lack of access to credit. This prevents fishers accessing better equipment and access offshore fishing grounds, releasing the pressure on the inshore resources. However numerous factors have to be taken into consideration before suggesting that there might be benefits in accessing richer offshore fishing grounds with more capital intensive equipment. The lack of access to credit also prevents better storage and handling facilities to be developed and this increases post harvest losses. By having no proper storage both fishers and fish traders are more sensitive to price fluctuations and are forced to sell their catch even when prices are very low and have no fish to sell when the catch is low and the price high. This in turn affects the costumers.

The lack of access to credit triggers unsustainable use of resources, by preventing the fishers to change fishing grounds, the pressure on the resource will increase and income decrease thus pushing fishers to use destructive gear such as beach seines.

The second most important constraint to livelihood development is the lack or weak management, which, coupled to the lack of access to credit exacerbates poverty and triggers

increased unsustainable use. Formal institutions were perceived as having the main role in management and very few or no community initiatives exist. The fact that the formal institutions are not carrying out their mandate effectively and communities are not or only punctually taking over has meant that the poverty cycle is perpetuated. However, enforcement of the law by the authorities would threaten the short term livelihood of numerous fishers (beach seiners and spear gunners), which makes this particularly challenging for both the communities and the government. However the Fisheries Department in both Kenya and Tanzania are trying to change their approach and empower communities more.

Third and partly the root of the constraints mentioned above, is the lack of community unity. Mistrust among community members prevents them to work together to improve management at a time where both Tanzanian and Kenyan governments are ready to welcome ground root initiatives (themselves increasing efforts to listen and involve communities in fisheries management). This constrains fisheries livelihood development by allowing destructive gear being used. Community unity can be a good tool for management, for example beach seines were banned from operating in Chumani by the fishers themselves. By increasing community based management initiatives, longer-term solutions could be found to phase out destructive gears. Community based management initiatives are stifled by the lack of community unity.

Furthermore, mistrust prevents self help groups to function and raise capital or manage equipment. The lack of access to credit is thus exacerbated by the lack of capacity of communities to form groups that can raise funding more easily than individuals and that are often necessary to manage and maintain more capital intensive item. The management and maintenance of capital intensive items are more costly.

3.5. Limits of the study

The type of nets used by fishing dependent households were not specified in the household surveys which was not foreseen. This has limited the reliability of the analysis of wealth in relation to gear use. This was overcome by using Pearson correlation and using occupational structure data (percentage of households using each gear) and households survey data (scores), this might have biased the results. The occupational structure could not be completed in one of the villages for the Tanzanian sites (Mlingotini), where village leaders were reluctant for their village to participate in the study, and this may have also affected the results.

Few sites were studied. They were selected to be as representative as possible. However some of the results could be affected by the location chosen. The fact that traps were not widely used at the study sites, whereas they were identified as one of the main gears used in Kenya, for example, might be due to the site choices.

The findings and implications of this livelihoods analysis is going to be analysed further, in comparison with the findings of the reviews and workshops, in order to draw out the opportunities and constraints to fisheries –livelihood development. This is done in the comparative analysis (Annex 4).

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5. Appendices

Appendix 1: Examples of interview guides for investigating resource use patterns

Appendix 2: Questionnaire form used a/ in Kenya (half English/half Swahili) and b/ Tanzania (all Swahili)

Appendix 3: Example of a sequence of coping strategies

APPENDIX 1: Examples of interview guides for investigating resource use patterns

Interview guides for fishermen and fish traders:

What activities:

- What do they do else than fishing and when?

How many and who:

- How many fishermen use the gear in the village per season if it changes?
- When the group is composed of diversity of gears: ask the number of fishers for each of the types of nets/gears, if it is the bunduki group make the difference between the ones fishing exclusively for octopus and the others. **Ask per season.**
- Is it mainly old, young, middle age fishers who use the gear. Give a proportion, ask **per season** if relevant and **per gear** (if bunduki make the difference octopus mainly and others)
- Is it local fishers or outsiders mainly (give a proportion)? **ask per season.**

How :

On the gear (areas of interest as well)

- Describe the fishing gear
- What is it made of
- Do the fishers make it, do they buy it?
- How much does it cost?
- Where do they buy it?
- Do they own the gear? Give a number of fishers who own their own net for example?
- If they don't own the gear, how is the catch divided, what proportion goes to the gear owner?

Gear use:

- How do they use the gear
- What do they use on top of the main gear (e.g. mask, goggle, flippers ask per season if relevant.
- Do they need a boat? If yes, what type of boat do they use (for the different gears represented in the group),
- How many people go out per boat?
- How is the catch divided, when several fishers go in a boat? How much for the fishers? How much for the boat owner?
- How many boats are there in the village (per type)? **differentiate**- Landing sites and villages.
- How many fishers own their own boat (for the different gears represented in the group)?- **Differentiate** landing sites and villages.

Where do they go fishing?

- Biophysical characteristics (sea grass, rocky areas, shallow waters, deep waters (attention here to interpret well!), sandy areas etc), **ask per season**
- How long does it take them to get to their fishing area? **Ask per season.**
- Do they fish in the same place every day (do they have their own areas/turfs, if so how is it decided/what are the rules?), **ask per season.**
- Do they change fishing grounds according to the season?
- Do they change regularly?

When?

- Do they fish at low tide, high tide, day, night? **Ask per season.**
- Are there any days they don't go fishing? **Ask per season.**
- Which days and why? **Ask per season**
- How many times a day? **Ask per season**
- How much time at sea? **Ask per season**

Species targeted

- Which are species they are after, what do they catch mainly (don't forget to ask for all the gears represented in the group)? **Ask per season**

How much?

- How much do they catch? **Ask per season**
- Have they noticed any changes over the years in terms of quantity caught? Size of fish /majongoo/kamba caught? **Differentiate per season.**
- Prices of different fish.

General/governance

- What are the main problems they have?
- What are the main changes they have noticed over the years?
- What are the rules for fishing/authorisations (BMC, Beach Chairman...)?
- What are the informal arrangements? Are there any taboos?
- Are there any illegal gears being used?
- Do they sell **all** their fish? Or do they keep some to eat?
- Who do they sell to (what type of trader)? All of it? Which species do they sell to who?
- What is the role of the EMC?
- What is the role of the Fisheries Department?
- What is the role of the Fishermen's association (if relevant)?

FISH TRADERS: Mama/baba karangas/dryers/dagaa and wachuruzi/ samaki bichi, majongoo.

Activities:

- What other activities do they do than trading and when? When do they trade?

How many and who:

- How many mama/baba karangas or how many fish traders/majongo? Ask per season.
- Proportion of old, young, middle age, ladies, men...
- Proportion of outsiders (from the village).

How:

- Transport: own transport ? what means of transport do they use?
- Preservation, where do they get ice if they do etc.
- Do they work in groups?
- Do they deal with specific fishermen...How is it decided? **Ask per season**

Where:

- Where do they get their fish/majongoo? **Ask per season**
- Where do they sell the fish (mainly out of the village? In the village? Give a proportion if possible). /who do they sell to (fish shops, private houses etc) ? Do they have specific customers. **Ask per season**

When:

- When do they do they trade most

- How long does it take to finish the day's catch
- Mama Karangas: When do they sell mainly?

Species:

- What type of fish or other marine products do they buy? **Ask per season**
- Do they specialise in anything? (check for differences in mama karangas) **Ask per season.**

How much:

- How much fish/majongoo do they buy per day on average? **Ask per season**
- How much money do they reckon they - **ask per season**
- Have they noticed any changes over the years in size and quantity for each season?

General:

- What are the main problems they have?
- Working principles?
- Relations with the DoF, Relations with the EMC/Beach leader if exists or other traditional authorities (authorisations? Rules?)

Appendix 2: Questionnaire form used a/ in Kenya (half English/half Swahili) and b/ Tanzania (all Swahili)-

When necessary the English translation is given in brackets in italics. English translation is given in questionnaire B only where the ranking order of items of strategies differed from questionnaire A.

A/ QUESTIONNAIRE (Questionnaire number:.....)

Date: **Interviewer's name:**.....
Village:.....

Part A: General (for everyone)

Name of head of household:..... *** Is the head a single lady?** Yes / No

1. Watu wangapi wanaisha nyumba (share pesa and food)?(how many people in the household?)

2. How old is the head of household?

3. What is the main activity of the household for food (a):..... For money (b):.....

4. Kuna wavuvi (Are there fishers in the household)? Yes / No **5. Kuna mama karanga** ? Yes / No (are there fish fryers)

6. Kuna wachuruzi (samaki ya bahari)? Yes / No (Are there Fish traders?)

- **NYUMBA:** *Look at the houses/ ask the person to show you the houses which belong to her/his households (circle the appropriate score and write the number of houses)*

7. Walls of the houses (ukuta)

8. Roof of the houses (paa)

Ukuta	Score (a)	Number houses (b)
No house	0	
Makuti mabaya (thatch bad)	1	
Makuti mazuri (Thatch good)	2	
Udongo mabaya (mud bad)	3	
Udongo mazuri (mud good)	4	
Mtomo (partial) (stones)	5	
Mtomo (yote-all) (stones)	6	
Coral blocks (partial)	7	
Coral blocks (all)	8	
Plaster and paint (partial)	9	
Plaster and paint (all)	10	

Paa	Score (a)	Number houses (b)
No roof	0	
Makuti mabaya	1	
Makuti mazuri	2	
Mabati mabaya (corrugated iron)	3	
Mabati mazuri	4	
Asbestos	5	

- **ASSETS/CAPITAL:** (circle appropriate score and write numbers for wanyama)

9. Kuna wanyama ? wapi?)

(Do you have livestock?)

Wanyama	Score (a)	Nber (b)
Hakuna (none)	0	
Kuku/bata (chickens/ducks)	1	
Mbuzi (goat)	2	
Ngombe (cow)	3	

10. Kuna Transport binafsi? 11. Maji (wana pata wapi?)

(Do you have private transport?) (Where do you get water?)

Transport	Score
Hakuna	0
Bicycle	1
Gari (car)	2

Maji	Score
River/kisima public/free	0
Wanunua maji (buy water)	1
Storage tank yao (private)	2
Mfereji yao (private) (tap)	3
Kisima yao (private) (well)	4

- **HALI (CHAKULA).** (tick the right box- how many times it happens in the whole year)

12. <u>Siku za Shida</u> (days of crisis)	More than mara moja kwa wiki (1) (once a week)	Mara moja kwa wiki (2) (once a week)	Kila wiki mbili (3) (every 2 weeks)	Kila mwezi ao mwezi mbili (4) (Every 1 or 3 months)	mara 1 to 5 kwa mwaka (5) (1-5 times a year)	Bad o (6) (never)
Watu kunywa uji (a) (eat porridge)						
Kutokula mchana (b) (skip meal)						
Omba duka ama family (c) (borrow from shop or family)						
Lala na njaa (d) (sleep and not eat)						

13. Watu wa nyumba na kula (days of surplus)

Sima (a) (maize meal)						
Mchele (b) (rice)						
Nyama (all meat) (c)						
Samaki (d) (fish)						
Chapati (e)						
Pilau (f)						

PART B. Kama wako wavuvi ao mama karanga ao wachuruzi (if there are fishermen or fish traders)

14. Wako mama karanga wangapi? (how many fish fryers in the household?).....

15. Wako Wachuruzi wangapi? (How many fresh fish traders?).....

- Kama wako wavuvi uliza maswali (16a, b, c, d). kama hakuna andelea swali 17. (if there are fishermen in the household answer questions 16, if not go to question 17)

16 (a). Wako wavuvi wangapi? (How many fishers are there?) 16 (b). Wana tumia chumbo (dau)? Yes / No (Do they use a boat?)

16 (c). Dau aina gani? (Which boat?).....

16 (d). Wana vyombo (dau) vyao? (do they own a boat?) 16 (e) Wana tumia mitego gani (mwaka mzima)?

(Which gear do they use? All year

round?)

Wana vyombo aina gani	Score (a)	Number (b)
None	0	
Dau (dug out)	1	
Ngalawa (out rigger)	2	
mashua	3	
Boat with engine	4	

Orodha ya mitego (List of gear) (a)	Number fishers using (b)

17. Tafadhali fanya orodha ya shuhuli yote za nyumba (ni kwa mwaka mzima) na rank* (list then rank all activities of the households according to importance)

Shuhuli ya chakula (a) (Source of food)	Order of importance (b)	Shuhuli ya pesa (c) (Sources of income)	Order of importance (d)

*1: ni muhimu sana (the activity which brings most food or pesa) 7: si muhimu sana (brings least pesa or food)

b/ DODOSO

Namba ya Dodoso

Tarehe:.....

Jina la Msaili:.....

Kijiji:.....

SEHEMU A: Maswali ya Jumla (Kwa yeyote)

Jina la Mkuu wa Kaya:.....

* Je, Mkuu wa kaya ni

mwanamama

anyeishi bila mume? Ndio / Hapana

1. Watu wangapi wanaishi kwenye kaya hii (wanaoshiriki kipato chao mfano fedha, chakula n.k.)?

2. Mkuu wa kaya ana umri gani?

3. Katika kaya hii, ni shughuli gani inayotegemewa zaidi kwa ajili ya kuzalisha:

Chakula (a):.....

Fedha(b):

4. Je, kaya hii ina wavuvi? Ndio / Hapana

4a. Je, Kaya hii ina fundi cha

chumbo? Ndio / Hapana

5. kuna mama wakaangaji/ wakaushaji wa samaki/dagaa kaya hii? Ndio / Hapana

6. Je, kaya hii ina wachuuzi wa samaki bichi au wachuuzi wa majongoo? Ndio / Hapana

6.a. Je, kaya hii ina wachuuzi ya barafu? Ndio / Hapana

NYUMBA: Mwambie Msailiwa akuonyeshe nyumba anayoishi (wanazoishi) yeye na kaya yake, tazama jedwali zifuatazo hapa chini, zungushia mdura kwenye alama sahihi kwa kulinganisha uonayo kwenye nyumba na jedwali

7. Kuta za Nyumba

Ukuta	Alama (a)	Idadi ya Nyumba (b)
Hakuna Nyumba	0	
Makuti Dhaifu	1	
Makuti Imara	2	
Udongo Dhaifu	3	
Udongo Imara	4	
Mawe Sehemu Chache	5	
Mawe Nyumba Nzima	6	
Matofali Sehemu Chache	7	
Matofali Nyumba Nzima	8	
Plasta/Rangi Sehemu Chache	9	
Plasta/Rangi Nyumba Nzima	10	

8. Paa la Nyumba

Paa	Alama (a)	Idadi ya Nyumba (b)
Hakuna Paa	0	
Makuti Dhaifu	1	
Makuti Imara	2	
Mabati Dhaifu	3	
Mabati Imara	4	
Mabati ya Asbestos	5	

RASILIMALI MTAJI: (Tazama majedwali yafuatayo hapo chini. Zungushia penye alama sahihi inayolingana na habari anazotoa msailiwa na kisha andika idadi ya wanyama aliyonayo msailiwa)

9. Una Wanyama? Wapi Maji?

Wanyama	Alama (a)	Idadi (b)
Hakuna	0	
Kuku/bata	1	
Mbuzi/kondoo	2	
Ngombe	3	

10. Una Usafiri binafsi?

Usafiri	Alama
Hakuna	0
Baiskeli	1
Piki piki	1.5
Gari	2

11. Mnapata

Maji	Alama
Mto/kisima/Bomba la Bure la Umma	0
Wananunua maji	1
Wana Bomba nje wao binafsi (<i>private pump outside</i>)	2
Wana Bomba ndani ya nyumba Wao Binafsi (<i>private tap inside house</i>)	3
Wana tangi Chao Binafsi la kuhifadhi maji (<i>private tank</i>)	4

HALI YA(CHAKULA). (Weka alama ya Vema kwenye boksi sahihi katika jedwali lifuatalo kuonyesha ni mara ngapi jambo hilo hutokea kwa mwaka)*

12. Siku za Shida	Zaidi ya mara moja kwa wiki (1)	Mara moja kwa wiki (2)	Kila wiki mbili (3)	Kila mwezi au miezi mbili (4)	mara 1-5 kwa mwaka (5)	Haija tokea (6)
Watu kunywa uji (a)						
Kukopa dukani ama jamaa (b) (borrow from shop or family)						
Kutokula mchana (c) (skip meal)						
Kulala na njaa (d)						

13. Watu wa nyumba na kula

Muhogo (a) (cassava)						
Ugali (b) (maize meal)						
chapati (c)						
Samaki/dagaa/kamba/pwe za (d) (fish,, octopus, prawns etc)						
Nyama (e) (meat)						
Pilau (f)						

*Mwezi ni siku 30- Mwezi moja kwa mwaka= kila wiki mbili

SEHEMU B. Idadi ya Wavuvi, mafundi vya vyombo, wachuuzi ya barafu, Mama Wakaanga Samaki na Wachuuzi wa samaki na wa majongoo Ndani ya Kaya

14. Je, Wapo akina mama wakaangaji/ wakaushaji wa samaki/dagaa wangapi?.....

15. Wapo Wachuuzi wangapi (samaki /majongoo)? 15a. Wapo mafundi (vyombo) wangapi?.....

- **Kama wapo wavuvi uliza maswali (16a, b, c, d). kama hakuna andelea swali 17.**

16 (a). Je Wapo wavuvi wangapi?

16 (b). Wavuvi hawa wanatumia chombo? Ndio / Hapana

16 (c). Kama ndio, je, wanatumia chombo aina gani?

16 (d). Je wavuvi wa kaya hii wanamiliki wanatumia vyombo vyao binafsi? mzima)?

16 (e) Hawa wavuvi mitego gani (mwaka

Aina ya chombo	Alama (a)	Idadi (b)
Hakuna wala hakuna umiliki wa	0	

Mitego (nyavu gani, mkono, zamia...)	Idadi ya Wavuvi wanaotumia
(a)	(b)

pamoja		
Anamiliki Dau Pamoja na Wenziwe	1	
Anamiliki Dau Peke Yake	1.5	
Anamiliki Ngalawa Pamoja na Wenziwe	2	
Anamiliki Ngalawa Peke Yake	2.5	
Anamiliki Mashua Pamoja na Wenziwe	3	
Anamiliki Mashua Peke Yake	3.5	
Anamiliki Boti yenye injini Pamoja na Wenziwe	4	
Anamiliki Boti yenye injini Peke Yake	4.5	

17. Tafadhali tengeneza orodha ya shughuli zote za kaya (kwa mwaka mzima). Andika kufuatana na umuhimu kwa kuweka alama 1 **mpaka** 7. Andika kwanza ile shughuli iliyo muhimu zaidi ikifuatiwa na zile ambazo zina umuhimu kidogo (*Tazama Kielelezo namba 1 hapo chini*)

Shughuli ya chakula

Shughuli inayochangia chakula (a)	Umuhimu wa Shughuli (b)

Shughuli ya pesa

Shughuli inayochangia fedha(c)	Umuhimu wa Shughuli (d)

KIELELEZO NAMBA 1:

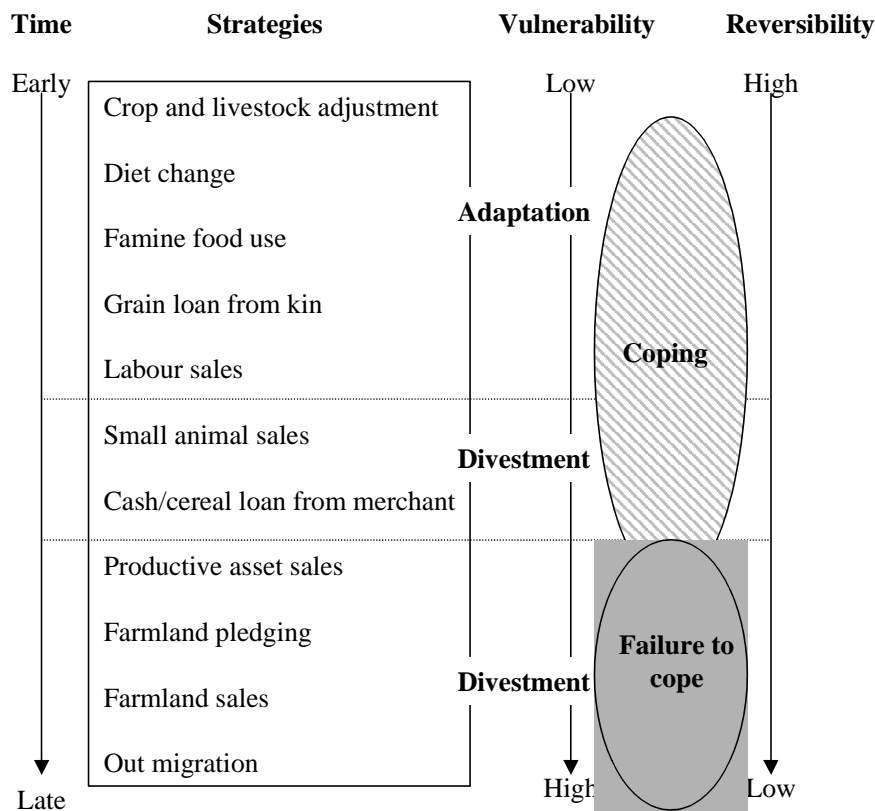
1 = Hii ni shughuli muhimu sana inayochangia karibu chakula chote ama fedha zote zitumikazo

ndani ya kaya

7 = Hii sio shughuli muhimu sana. Kipato chake kinachangia fedha au chakula kidogo tu

kinachotumika ndani ya kaya

Appendix 3: Example of a sequence of coping strategies



At early stages of the crisis, risk minimising strategies are used (e.g. reduce consumption, eat least favourite foods), if the crisis continues, more commitment is made in order to meet subsistence needs (e.g. sale of liquid assets, sale of productive assets) which makes it more and more difficult to come back to the pre-crisis stage. In the late stage of the crisis, destitution (e.g. land sales) and distress migration can occur indicating the households have failed to cope. *Source:* adaptation from Watts (1983); Maxwell and Frankenberger (1992); Davies (1993) and Nyborg and Haug (1995).