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Mnazi Bay Ruvuma Estuary Marine Park

# The Occupational Structure of the Mnazi Bay Ruvuma Estuary Marine Park Communities

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July 2004

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**For the UNDP/GEF Development of**
**Mnazi Bay Ruvuma Estuary Marine Park (MBREMP) Project**

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## Table of Contents



List of Tables:

List of Maps:



List of Figures:



List of Appendices:

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# EXECUTIVE SUMMARY

The occupational structure is only one part of the baseline socio-economic assessment of MBREMP. However it is an essential part because by understanding the occupational structure of communities within an Marine Protected Area (MPA) one achieves a key step towards understanding the people of the MPA and their complex livelihood strategies. MBREMP is an unusual MPA because it includes an estimated 28,000 people (12 villages) within its boundaries who use and depend on the natural resources the MPA is seeking to conserve. Socio-economic information on these communities is thus essential to understanding the threats to the marine resources, and to uncovering the socio-economic vulnerabilities of communities, and this in turn is essential information for effective management of the MPA.

Data was collected in August 2003 by the Park under guidance from CORDIO-SEMP (the Coral Reef Degradation in the Indian Ocean project's Socio-Economic Monitoring Programme for East Africa). The data was analysed by CORDIO in March 2004.

Information on 4958 households was collected through key informant interviews. 55 activities were identified in the Park and grouped into 7 categories for the purpose of the analysis. Results show that the most widely spread activity is farming (87% of the Park households), the main cash crops being cashew nuts and rice. The second most important category of activity is marine related with 35% of the Park households involved (fishing, shell collecting, sea cucumber and octopus harvesting, fish and other marine products trading, and seaweed farming), with 26% of households involved in fishing. Dependence on marine resources was found to be comparable to other areas in Tanzania. Other natural resources are also important to the livelihoods of Park households (weaving of palm, charcoal production, carving etc) with 21 % of households involved in this category of activity. Salaried employment is scarce in the area.

The occupational structure of villages varied according to the village locations. 4 groups were identified: the sea front villages (Msimbati, Mkubiru and Mngoji) where there is the highest dependence on marine resources (up to 74% of households in Msimbati involved in marine related activities); the mangrove villages, some of which the dependence on marine resources was close to the level of sea front villages such as for Tangazo and Litembe where a high number of fishers are located; and the river villages and other villages where dependence on the marine resources is minimal but dependence on farming highest. Note that 'dependence on' does not infer 'sole dependence on'. Households depend on/are involved in a variety of livelihood activities.

The results suggested that the strongest dependence on marine resources (that is sole income source) is found in Msimbati, Mkubiru, Mngoji (sea front) and also Tangazo (mangrove). The highest numbers of households involved in fishing were found in Msimbati, Mngoji and Tangazo. Msimbati comes out as the main marine product trading centre.

Other activities of concern to the Park were investigated, particularly livelihood activities based on other natural resources (non-marine related), such as charcoal production (from mangroves or other wood), palm frond weaving, wood carving, lime production, and mangrove trading and cutting. These are land based activities that may impact the natural resource base of the Park. Understandably, very little information was obtained on illegal activities; however results showed that the centres for charcoal production (which requires permits and is a potential environmental threat) are located in mangrove villages (Madimba, Litembe, Mitambo) and Mngoji.

Core threat areas to the marine resources are thus found in Msimbati, Tangazo, Mngoji and Mkubiru where high numbers of fishers are located and/or a large percentage of the households depend on fishing. These are recommended to be areas of focus of Park activities to achieve sustainable use of resources. However these areas also should be the focus of mitigating actions, as these are the village households that will be the most vulnerable to any changes in resource use regimes.

Further research is recommended particularly on the current level of use of marine and non marine resources. Options for investigating alternative income generating activities are proposed, particularly building on the cashew nut production. This research ties in with the different biodiversity assessments, and other research planned. Finally it is recommended that the occupational structure of park communities is monitored so that changes in marine dependence and uptake of alternative livelihood activities can be detected.

# 1. Introduction

The Mnazi Bay - Ruvuma Estuary Marine Park (MREMP) was gazetted in 2000. It covers an area of 650 sqkm, 450 sqKm of which are land. The remaining 200 sqkm are marine including mangrove forests, islands and coral reefs. The rationale behind incorporating such a wide area of land into the Park was to constitute a buffer zone and control human activities which impact the protected marine environment. The aim was also to ensure that local marine resource users would be included in the management and planning processes as required by *Marine Parks and Reserves Act (1994)*. However, incorporating this wide area of land also meant incorporating 11 villages, 3 sub-villages and a population of approximately 28 000 people. Furthermore, population densities around the Park are high (UNDP/GEF, 2000). Biophysical assessments of the area have shown that the marine environment is highly impacted by human activities, particularly by overfishing, destructive fishing, coral mining (Guard *et a*l 1998, UNDP/GEF, 2000 and Obura, Church and Richmond pers. comm.) and mangrove forests already bear the mark of intensive use (Wagner *et al.*, 2004).

A project was initiated in 2002 in order to assist the Government of Tanzania in "conserving a representative example of internationally significant and threatened marine biodiversity", with a parallel objective to "enable local and government stakeholders to protect effectively and utilise sustainably marine biodiversity and resources of the MBREMP". One of the main objectives of the project is thus to reduce pressure on the marine environment in order to achieve sustainable utilisation of the marine resources and conservation of the marine biodiversity (UNDP/GEF, 2000).

A series of biodiversity assessments of different habitats are being carried out to establish baseline knowledge on mangroves, corals, intertidal areas and sea grasses and status of the marine resources. A socio-economic assessment is also being carried out to establish an understanding of the social and economic context within which people living in the Park use and/or impact these marine resources. These assessments will contribute to inform the development of a Park management plan, particularly a zoning plan and other conservation strategies. This report, on the occupational structure of the MBREMP communities, is the first step of a comprehensive socio-economic assessment which will provide key information for reducing the pressure on marine resources and developing strategies to promote alternative livelihood activities.

## 1.1. Background to this study

Although non governmental organisations (NGOs) and programmes such as the FINNIDA Regional Integrated Programme Support (RIPS), Concern, Voluntary Service Overseas (VSO), Medecins Sans Frontiers (MSF), Peacecorps and Japan International Coorporation Agency (JICA) have been operating in Southern Tanzania for a number of years, socio-economic information is patchy and scarce on the Park area. A socio-economic assessment was carried out at the time of the design of the project however only a preliminary version of the report was submitted (UNDP/GEF, 2000) for the purpose of the project establishment, but the full report is not available.

The occupational structure of a community shows what households do for a living be it for income or subsistence (Berkes *et al.*, 2001, Pomeroy *et al.*, 2003). It provides a "map" of the activities which constitute the communities' complex livelihood systems. Establishing an understanding of the occupational structure of the communities within the MBREMP will contribute to determining the dependence on marine resources at the community and Park levels. In this case, ‘dependence on’ does not infer ‘sole dependence on’. Households depend on, or are involved in a variety of activities. Sole dependence will be specified.

Determining the dependence on marine resources will thus contribute to identifying zones of potential high impact (threats) on marine resources within the Park. The occupational structure also establishes a comprehensive sampling frame of households for future research use. In the long term, if monitored, the occupational structure will help predict whether pressure on marine resources is likely to increase or decrease, it will also indicate whether the development or promotion of alternative livelihood activities by the project are successful or not.

Understanding the occupational structure of the communities and identifying core areas of dependence will assist the Park in working more effectively by focusing research and support on these areas for reducing pressure on marine resources. The occupational structure will also provide the Park with knowledge on the variety of existing activities which could potentially be developed further from the perspective of diversifying the income base in the Park area to reduce pressure on marine and other natural resources.

The aim of establishing the occupational structure of the Park is thus to contribute to:

- Determine the level of dependence on the marine resources at the community and sub-community level enabling the Park management to focus particularly on the most dependent areas for example for mitigating the negative socio-economic effects of conservation activities, awareness raising etc.
- Identify the variety of activities that composes the livelihood systems on which communities depend in the Park
- Establish a baseline for further monitoring both in the context of the Park objectives and in the context of the regional CORDIO Socio-economic Monitoring Project (SEMP)
- Establish a comprehensive sampling frame of households and attributes which will enable statistical sampling for more detailed socio-economic research
- Identify topics for further research
- Establishing the first building block for the development of alternative or supplementary income generating activities to reduce pressure on marine and other natural resources.

## 1.2. Objectives of this Consultancy

Information on the occupational structure of the MBREMP communities started to be collected in August 2003 with guidance from CORDIO SEMP. This involved MBREMP in the wider CORDIO SEMP network which aims to establish socio-economic monitoring on the East African coast to improve coastal and fisheries management. Training for the Park staff on collecting, entering and analysing the data was provided in July 2003. Training notes (guide sheets) and draft guidelines on analysis were provided to the MBREMP office by SEMP. However, to meet the GEF project need for comprehensive baseline information, data was collected on all the villages and sub-villages of the Park rather that on sampled villages as would be the case for monitoring. This meant that the volume of data gathered was large (on over 4,500 households) and therefore Park staff needed additional support for analysis and data processing. Within SEMP, where possible, all aspects of the work are carried out by local personnel with guidance from SEMP, promoting a 'learning by doing' approach and ensuring long term implementation by integrating socio-economic monitoring into established work schedules. In addition, livelihood activities other than marine based were also investigated in more depth than would be necessary in the context of SEMP.

As stated in the Terms of reference (TOR-Appendix A) the aim of this consultancy is to complete the analysis of the occupational structure data collected by MBREMP in August 2003. This report constitutes the first part and starting point for a detailed socio-economic assessment of MBREMP.

The Park covers a diversity of environments which will partly determine natural resource based activities of the different Park communities. Approximately 2/3 of the area is terrestrial and 1/3 marine. The terrestrial component can be considered to have three different environments which determine to some extent the livelihood activities, the low seafront area with sandy loam and coral rag, the higher ground inland, and the river floodplain. Infrastructure, such as roads and markets, will also affect the kind of livelihood activities carried out.

The occupational structure was thus investigated at the village and quarter level. Villages ('*vijiji*') are divided into sub-villages ('*vitongoji*') for administrative purposes, quarters refer to local sub-divisions of the villages which may correspond to the sub-village (administrative entity) or may not.

Marine resource dependent households (including seaweed farming households) are households which depend at least partly on marine resources for their livelihood. They are the main focus for the Park management as they represent the main threat to marine biodiversity in the Park area. Detailed analysis was thus done on these households and their level of dependence on marine resources. Finally the distribution of some key activities, which are not widespread but are of special interest for

the management of the Park, such as wood trading and exploitation (including mangrove), charcoal production, wood carving, lime production, were also analysed.

This report, as per the TOR, includes the following information:

- Methods
- Results at the Park level: importance of fisheries for livelihoods
- Results at the village level
- Results at the sub-village level for the most marine resource dependent households
- Identification and distribution of key livelihood activities
- Details of activities in fisheries dependent households

Inconsistencies in the data and information to be checked will be pointed out in this report. Recommendations for more detailed research in the socio-economic assessment are also made.

## 1.3. Methodology, sites

Data collection was done through key informant interviews (Bunce *et al.*, 2000). Two to four informants, including women, with a good knowledge of the community they live in, were selected per quarter, with the help of the marine Park Village Liaison Committees[1]. Indeed, due to the number of villages and the large size of these villages (up to 900 households), data collection was carried out at the quarter level. The SEMP trained a Park/project team, who then trained interviewers from the villages selected in collaboration with the Park Liaison Committees of each village.

The first step in the interview process was to agree on a definition of "household". 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).

During the interview process the key informants were asked to go mentally through the households in their area (following a pattern to avoid forgetting any households) (Bunce *et al.*, 2000) and list for each household the number of household members, the number of active members (those who contribute to the household’s livelihood) and all the activities that are carried out, not only for income but also for subsistence, by men and women. Informants were prompted, based on an interview guide (Appendix B), so that details and activities would not be missed.

Care was taken to ensure that activities carried out by women were also listed (e.g. weaving, fish trading, farming), prompting was required, and that further details were given when ‘business’ was mentioned (i.e. what type of business?). Details on marine resource dependent activities were given greater attention because of the focus of the Park (trading of fish and other marine products, and type of products, fishing and method used, seaweed farming, shell collecting etc.). In addition prompting was used to ensure that other key activities such as charcoal and lime production, mangrove cutting/trading, wood/timber trading, but also the types of cash crops cultivated would not be missed. Attention was also drawn to the fact that the researchers were interested in all of the activities for the whole year, not only in those going on during the season of the interview.

Due to the areas informants were reporting on, including a large number of households, several interview sessions were necessary. It is recommended that not more than 2 hours of interview time be used to solicit this kind of information to avoid informant fatigue and poor quality data (Slocum *et al.*, 1995).

[1] Village Liaison Committees were instituted by the Park management authority as the principle mechanism to involve local communities in marine Park activities, planning and decision making, Such committees are a requirement of the Marine Parks and Reserves Act (1994) as a means to ensure stakeholder participation in Park management and planning.

## 1.3.1. Limitations

At this stage the occupational structure provides a map of community activities and their relative importance at the community or sub-community levels (quarters, marine dependent households). Because of the large number of households covered, the information collected can only help determine the number of households involved or not in an activity during the year. The occupational structure data, in this study, does not provide information on:

- Whether occupations are full or part time
- Specific level of dependence at the household level (importance to a household of one activity in relation to another in terms of income or subsistence).

In some instances it is possible to ask the informants to rank the activities listed for each of the households (Pomeroy *et al.*, 2003). In this study, this was not asked, as villages and even quarters were often too large, the ranking exercise would have taken too long. Furthermore, it is doubtful that informants could provide such detailed information on each household (in some instances more than 200 households per informant). On the basis of the sample frame provided by this study, it was then possible to investigate further some of the aspects of the occupational structure, using a household survey. No proper sampling frame existed prior to the occupational structure.

One of the main drawbacks of this study is the lack of information on Nalingu village. People from Nalingu (which includes the subvillages of Mnazi and Mnete), one of the main fishing and seaweed farming villages in the Park, expressed the will not to be part of the project or of the Park. Discussions with the community have been interrupted since January 2004, when villagers threatened the Park staff with violence. It is thus important to note that the level of dependence on marine resources will be underestimated when aggregated at the Park level because of missing information from these seafront communities.

Finally, it is likely that the number of households involved in illegal activities in the Park (such as illegal mangrove harvesting, live coral mining, charcoal burning, hunting), may also be underestimated as informants would be reluctant to mention them. A more detailed and focused study will need to be carried out in order to estimate the extent of these activities. However the authors believe that areas where these activities were listed are probably areas where they are carried out more openly. The information will thus be useful to help Park management focus on some core geographical areas.

## 1.3.2. Analysis

For the purpose of this report, the term ‘quarter’ refers to sub-areas within the villages which might or might not be official divisions but are well known to the villagers. Although Mkubiru is a sub-village of a village located outside the Park boundary, it will be treated and referred to as a village in this report due to its size and distance from the village it comes under administratively.

Data was entered into Microsoft Excel by two people, under guidance from SEMP. A template provided by SEMP (see Appendix C) was used.

The household is 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). For each household the name of the village and quarter was noted and all activities listed by the informant were entered in separate columns. The activities were then grouped into a number of categories for the purpose of the analysis as shown in Figure 1.

Most of the analysis was done using basic statistics which sought to determine the proportion of households involved in different categories of activities. T tests were also used to investigate whether significant differences could be found in the average number of activities carried out by different types of households. Systat (version 10.2) and Excel (Microsoft) software were used for the analysis. Most of the analysis was carried out on data aggregated at the community level. For communities dependent on marine resources, data was also analysed at the quarter level. Further investigation of the occupational structure of marine dependent households was also done.

GIS technology/software was used to illustrate how the occupational structure, farming systems, and more specifically the level of dependence on fisheries resources by fisheries dependent households etc. (see maps 1 to 4) varied within the spatial context of the Park. A summary map was made showing the core zones of interest for the Park management in terms of threats to the marine biodiversity. However, it is important to note that village coordinates have to be confirmed (ground truthed), and that village boundaries and quarter location have yet to be determined, according to project staff this should be done in the near future. The maps in this report are thus based on approximate geographic position for some of the data.

Results are presented below, in section 2. Sub-sections 1 to 5 of the results concentrate on the general occupational structure at Park, village and quarter level (for marine dependent villages), importance of different marine associated activities (including seaweed), and farming activities. Section 2.6 focuses on marine resource dependent households and sub section 2.7, on the distribution of other activities of interest to Park management. In section 3, results of the study are discussed and suggestions for further research are made. This report is concluded by section 4.

# 2. Results

## 2.1. Demographic information on Park villages

In the course of the occupational structure, information was gathered on a total of 4958 households from 11 villages (including Mkubiru). Although some households might have been omitted, the authors are confident that most of the households were listed and thus the list provided will constitute a good sampling frame for further research, omitting Nalingu village.

When investigating the occupational structure, information on the number of household members, the number of active people in the households was also required. Table 1 below summarises the demographic information obtained.

**Table 1: Village size and contribution to the Park household population.**

| Villages | No. of households | Average of members | Average or active members | % of the Park households |
|---|---|---|---|---|
| Mkubiru | 199 | 3.6 | 2.1 | 4.0 |
| Mngoji | 434 | 3.6 | 2.1 | 8.8 |
| Msimbati | 911 | 3.7 | 2.1 | 18.4 |
| Madimba | 453 | 3.9 | 2.1 | 9.1 |
| Mitambo | 347 | 3.5 | 1.9 | 7.0 |
| Litembe | 323 | 3.4 | 1.9 | 6.5 |
| Tangazo | 921 | 3.8 | 2.2 | 18.6 |
| Kilambo | 563 | 3.3 | 2.2 | 11.4 |
| Mahurunga | 222 | 3.7 | 2.1 | 4.5 |
| Kitunguli | 313 | 2.3 | 1.1 | 6.3 |
| Kihimika | 272 | 4.1 | 2.1 | 5.5 |
| ***MBREMP*** | ***4958*** | ***3.5*** | ***2*** | ***100.0*** |

Source: this study

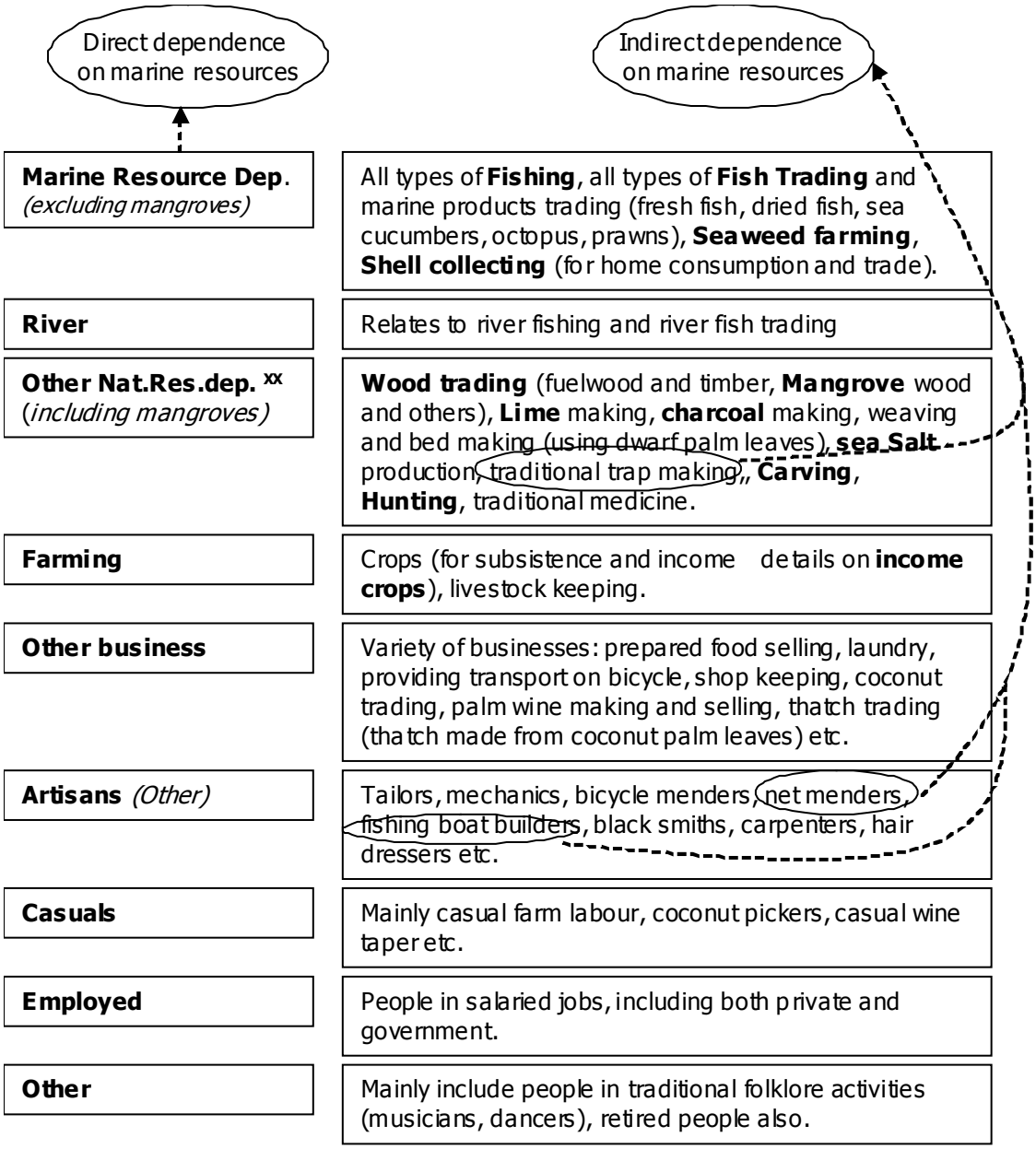
The largest villages, in descending order, are Tangazo, Msimbati, and Kilambo which amount to 47% of the Park's households (excluding Nalingu). On average, households in the Park have 3.5 household members, out of which 2 members contribute to income or subsistence food generation. Household size seems low, thus suggesting that children may not have been accounted for.

## 2.2 Diversity of activities

Findings show that a wide array of livelihood activities exist in the Park. These include marine related activities such as fishing, seaweed farming, shell collecting, fish, crustaceans, sea cucumbers and octopus trading. Other activities include river based fishing and fish trading, other natural resource exploitation such as wood trading (including mangrove wood, timber, fuelwood), weaving, sea salt production, farming for income or subsistence.

Traditional activities such as traditional medicine and folklore (dancers, musicians etc.) are also present, as are artisans including tailors, mechanics, carpenters, net menders, boat builders and a large variety of small businesses such as food vending (prepared food), palm wine production and trading, shop keeping etc. Figure 1 shows the way these activities were grouped for the purpose of the analysis.

**Figure 1: Categories of activities and groupings for the purpose of the analysis***

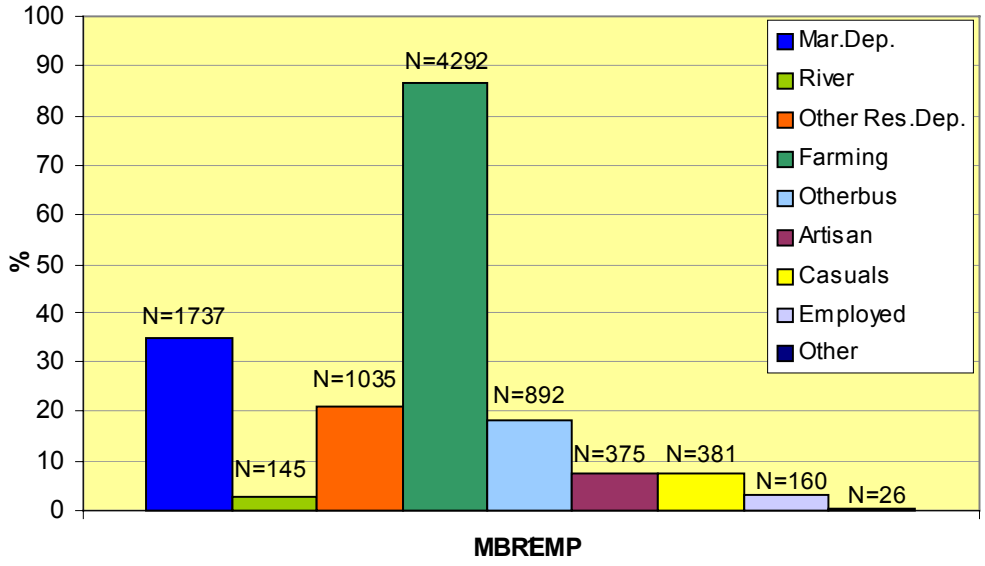



* Activities in bold are activities which are of focus and on which details will be provided

** Activities dependent on other natural resources are activities such as businesses or artisans that are separated from the general activity categories as although these activities are not the primary focus of the Park, they may impact existing marine and coastal biodiversity if not carried out sustainably, or they are natural resources based activities that might be of interest from the perspective of Alternative Income Generating (AIG) activities development.

Figure 2 shows the proportion of Park households who depend on each of these categories of activities.

**Figure 2: Dependence on the different activity categories at the Park level** *(excluding Nalingu village)*




Very few households depend on only one activity, thus the sum of households per category of occupations is higher than 4958 (100%). Each bar represents the proportion of households in the MBREMP who depends at least partly on the activity.

It was found that at the Park level, households depend on average on 1.73 categories of activity for their livelihood. In order of importance these are farming (87% households), marine associated activities (35% - excluding mangrove harvesting), other natural resources associated activities (21% households), other business (18% households), artisans, casual labour, employment, river dependent activities and other.

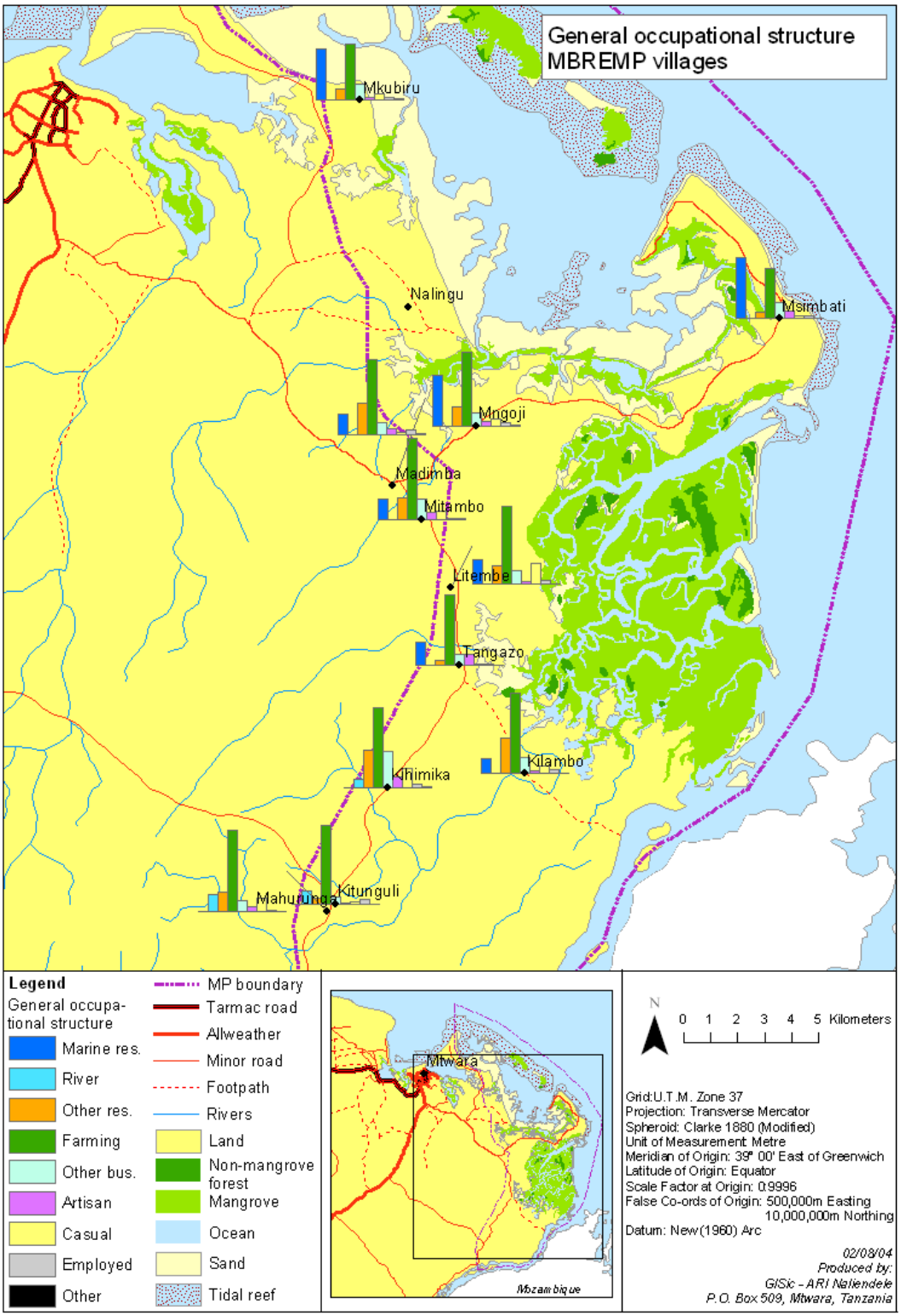
However, the general occupational structure is not homogeneous across the Park. It varies according to villages as shown in Map 1. Results showed that villages could be grouped according to their geographic location within the Park (on the basis of their proximity to the sea, to the river, the mangrove area). The village occupational structure varies across these different geographic locations, particularly the dependence on marine resources, illustrating the relationship between the physical environments and livelihood activities.

Villages can be grouped as follows:

- Sea bordering villages (Mkubiru, Nalingu, Mngoji and Msimbati). These villages represent 31% of the listed households, excluding Nalingu (see table 1)
- Mangrove villages (Madimba, Mitambo, Litembe, Tangazo and Kilambo). These villages represent more than half the households listed (52.6%, table 1).
- River villages (Kitunguli and Mahurunga) which represent 10.8% of the Park's households.
- Other: Kihimika which is located the furthest from the sea, river or mangrove (5.5% of the Park's households).

Natural resources exploitation it likely to be affected by the location of the villages in relation to these natural resources, however, other aspects such as access to markets and other infrastructure might have an impact which cannot be analysed at this stage.

**Map 1: Occupational structure at the community level**



As shown in Map 1, sea bordering villages are the most dependent on marine resources. More than 60% of their households are involved in marine associated activities (74% in Msimbati). Farming is one of the most important activities with 80% of households farming in Mngoji. Msimbati and Mkubiru are the villages with the least farming households (60% and 61% respectively) within the Park.

In all other villages, farming is by far the most widely spread activity with between 87% and 99% of households involved. However, although secondary, the dependence on marine and fisheries resources is still significant in the mangrove villages with between 20% (Kilambo) and 30% (Litembe) of households are involved in such activities. Part of Kilambo fishing might be carried out in the river, this will need verification from further research.

Fisheries dependence (fishing and fish trading) in Mahurunga, Kitunguli and Kihimika refer to River resources. Fishing is carried out by 15% to 19% of village households in Mahurunga and Kitunguli and only 9% of household fish in Kihimika (25 households).

Businesses (related to "other" natural resources and non natural resource based) are an important component of the communities' occupational structure.

Businesses associated with other natural resources constitute a significant part of livelihood systems, particularly in Kihimika where such activities involve 45% of the households and in the mangrove villages especially, Madimba, Kilambo, and Mitambo.

More than 12% of households are involved in "other businesses" in all villages except in Kitunguli. “Other business” is one of the dominant activities in Kihimika with 43% of the households involved. These other businesses are often an important part of a community's economy and essential at the household level for income, both for men and women (food vending etc).

Another important part of the communities' economic basis are artisans, these have an important place particularly in Tangazo and Kihimika where they represent more than 12% of listed households.

Finally casual labour, which is mainly farm labour (including coconut pickers) may be a last resort for getting an income, and is notably important in Litembe (25% of households) and Kihimika (22% of households).

Salaried employment rate is very low in all villages. It is highest in Madimba where 6% of households find a source of income through employment and lowest in Mitambo and Mahurunga (less than 1% of the households). Employment includes mainly public sector jobs such as teachers, police officers, nurses etc.

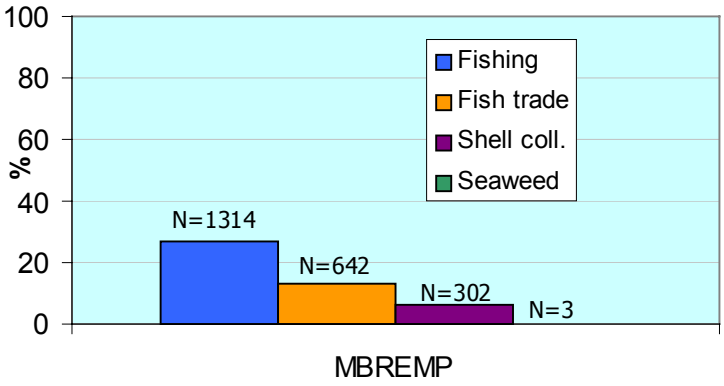
Thus throughout the Park natural resources (marine or other) are an important source of livelihood. Dependence on marine resources is high and varies according to the community location. It is highest in the sea bordering villages and lowest in the river villages.

## 2.3. Marine resource dependent activities

Activities directly associated with marine resources in the Park are fishing, fish trading (fresh fish, octopus, prawns, dried fish, sea cucumber), seaweed farming, and shell collecting (for trading, fish bait and home consumption).

Figure 3 shows that fishing is the most important marine resource associated activity at the Park level (26.5% of the MBREMP listed households are involved), then fish trading (12.9%), and shell collecting (6.1%). Seaweed farming, carried out in Mkubiru only is carried out by very few households. It is essential to note again that the importance of these activities is underestimated due to the lack of information on Nalingu.

**Figure 3: Dependence on the different marine resource activities at the Park level**




Note: Households may depend on more than one marine resource associated activity, thus the sum of households involved in each "marine" associated activity is greater than the total of marine dependent households (1737 households, see Figure 2).

Marine resource dependent households depend on 1 to 1.5 marine associated activities for their livelihood (see table 3, section 2.6.1).

Map 2 shows how the composition of marine associated activities varies across villages. Fishing is a dominant activity which is carried out by 54% (53.1% to 55.8%) of the households in the sea bordering villages and by 18.6% (11% to 25%) of households in the mangrove villages.

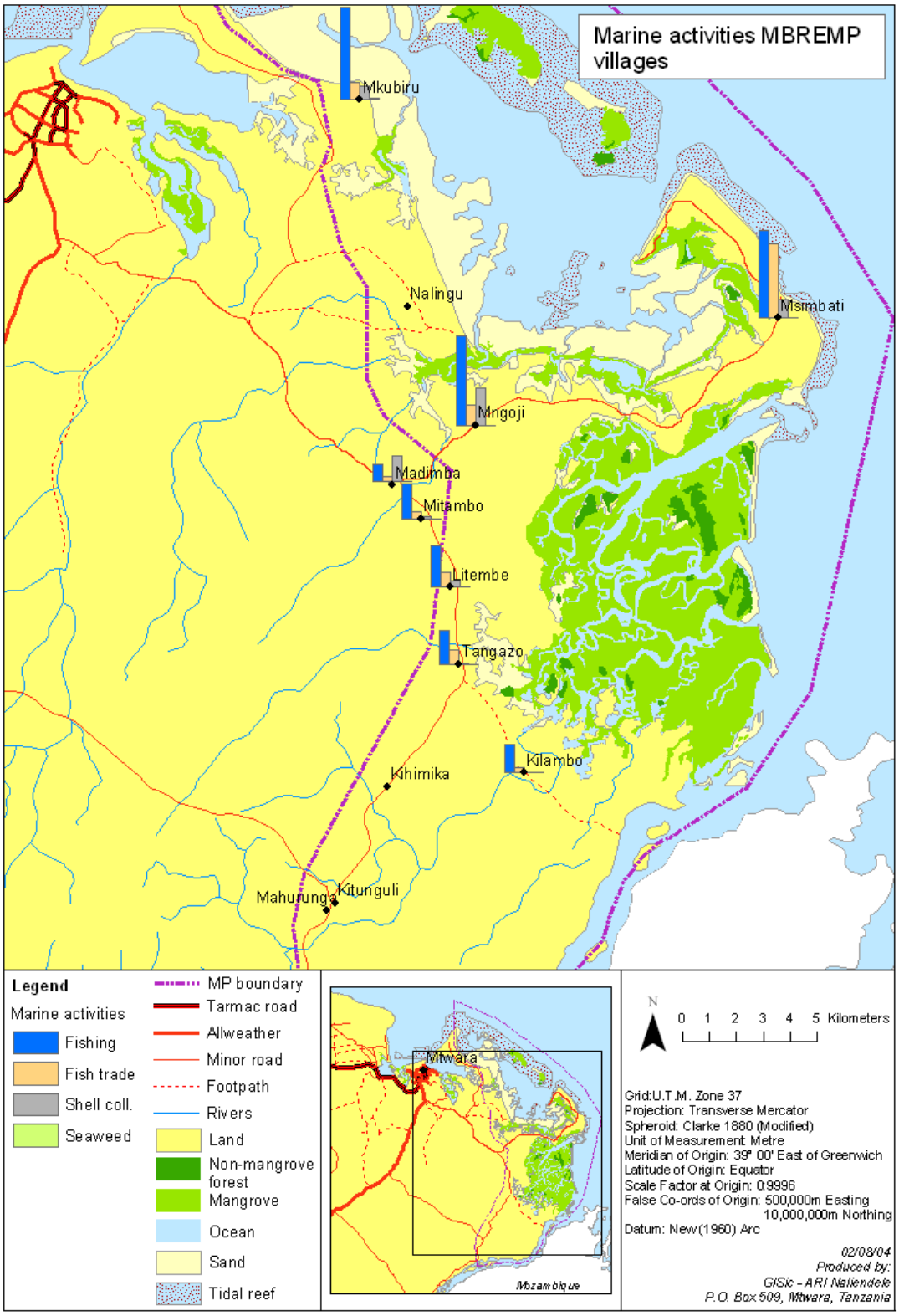
Fish trading is the second most important marine associated activity, but by some margin in most villages. Three exceptions were identified: Msimbati where more than 40% of households are involved in fish/other marine product trading, thus closely following fishing, and Mngoji and Madimba where the proportion of households collecting shells is higher than fish trading households.

The domination of Msimbati, in terms of fish trading is striking (approximately 60% of fish trading households are located in Msimbati, see Figure 9). UNDP/GEF (2000) assessment suggested that Msimbati was the main fish trading centre in the area, findings from this study confirm the UNDP/GEF results. However, cross checking will be necessary through the investigation of resource use patterns. The authors believe that fish trading may have been underestimated in other villages, particularly dried or fresh small-fry (dagaa) trading, or that fish trading activities have been overestimated in Msimbati where fishers may have been counted as fish traders.

13.7% of households are involved in shell collection and trading in sea bordering villages, while only 3.5% of households are involved in mangrove villages. Two villages stand out: Mngoji where 22% and Madimba where 16% of households are involved in shell collecting (for food or income) or trading. These figures will benefit from cross checking when more detailed investigations on resource use patterns are carried out.

Seaweed farming is only carried out in Mkubiru according to the results. However, Nalingu harboured the largest community of seaweed farmers in the Park (King, pers. omm..).

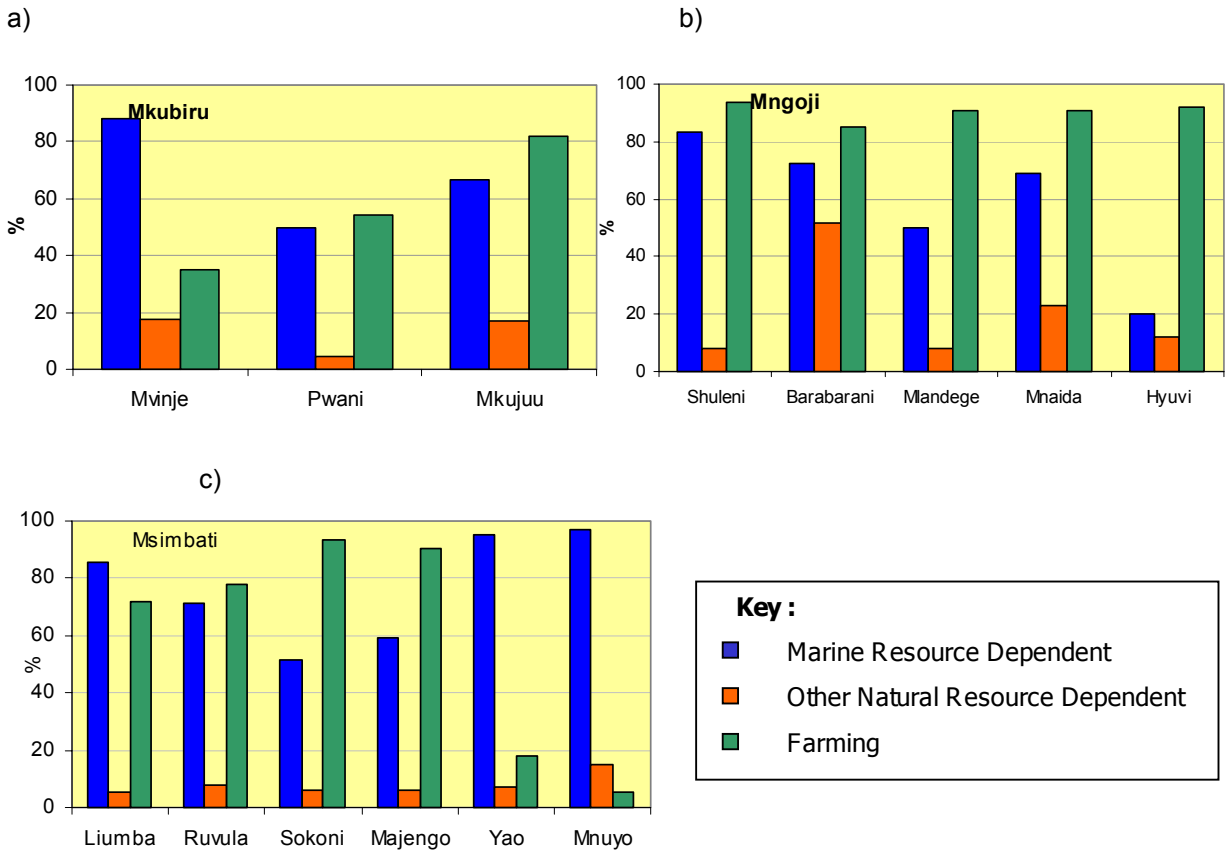
**Map 2: Proportions of households involved in the various marine resource associated activities per village**



## 2.4. Occupational structure at the quarter level for marine dependent villages

Dependence on marine resources varies across villages, but also within villages. Part of the occupational structure was investigated at the quarter level, for marine dependent villages. The proportion of households depending on marine resources, other natural resources and farming is presented in figures 4 to 5, for the sea bordering and mangrove villages.

**Figures 4a to c: Dependence on marine resources, other natural resources and farming at the quarter level for the sea bordering villages.**



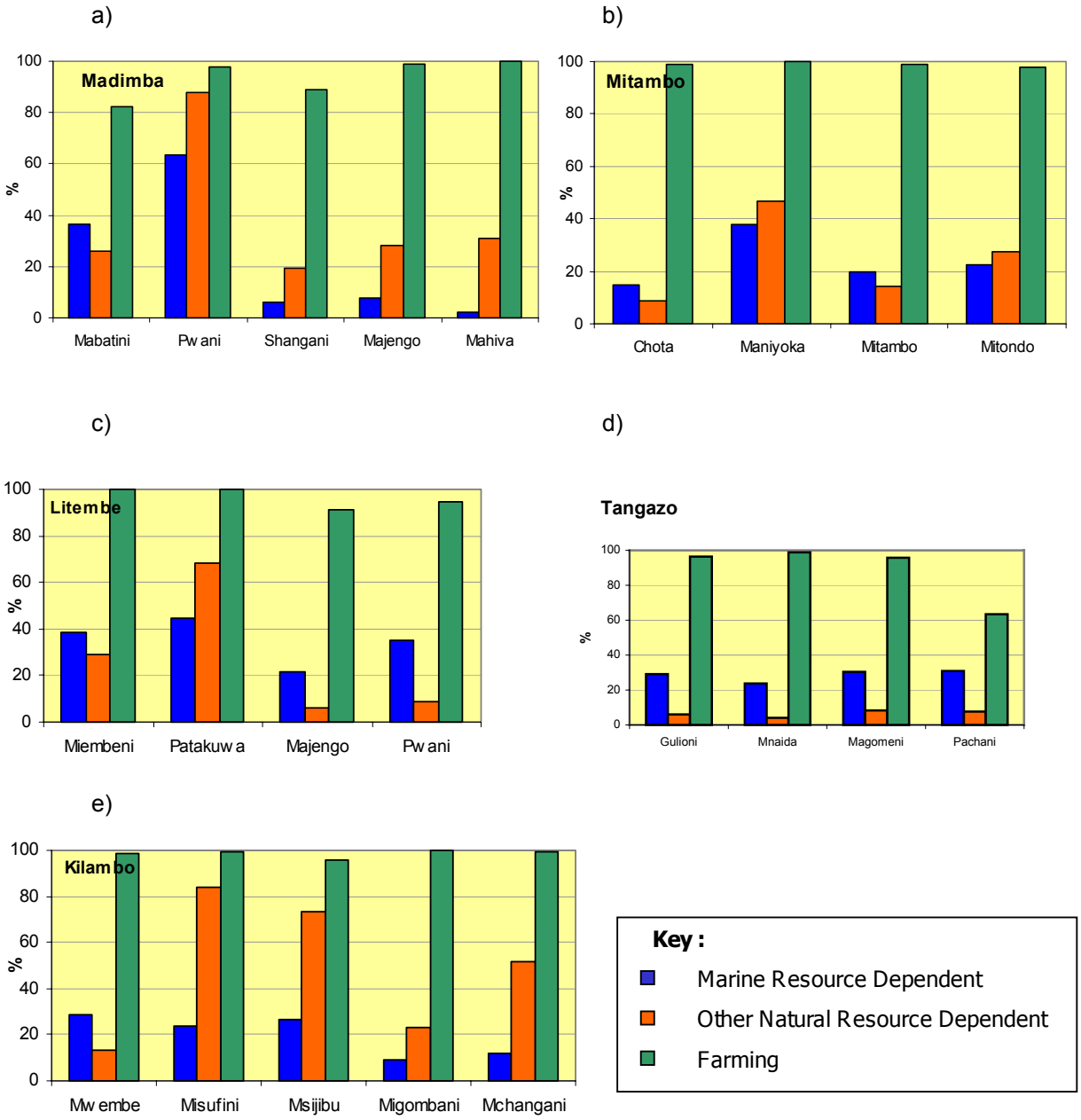

Note: households may depend on the three categories of activities, thus the sum of the proportion of households involved in each category of activity does not add to 100%.

Dependence on marine resources and other natural resources is relatively homogeneous across quarters of the sea bordering villages. As shown in Figures 4a to c, the proportion of households dependent on marine resources is high (between 50 and 97% of households). It is highest in Yao and Mnuyo (which amount to a third of Msimbati households - see Appendix D) where more than 95% of households depend at least partly on marine resources for their livelihood, excluding mangroves. Dependence is least in Hyuvi (11% of Mngoji households - Appendix D) where only 20% depend on marine resources.

Barabarani in Mngoji and Mnuyo in Msimbati have a higher proportion of households dependent on other natural resource (51% and 36%). These are mainly weaving in Barabarani. The lowest proportion of farming households is found in the quarters Mnuyo (less than 10%) and Yao (less than 20%) of Msimbati.

A similar analysis was done for the mangrove villages and is illustrated by Figures 5 (a to e) below.

**Figures 5 a to e: Dependence on marine resources, other natural resources and farming at the quarter level for mangrove villages**




Note: households may depend on the three categories of activities, thus the sum of the proportion of households involved in each category of activity does not add to 100%.

The dependence on marine resources is lower in mangrove villages than in sea bordering villages. However, pockets of higher dependence on marine resources were detected when investigating the occupational structure at the quarter level. This is the case for example of Pwani (21.6% of Madimba households- see Appendix D) where more than 60% of households depend on marine resources. This is mainly due to shell collecting which involves 51% of Pwani households. Quarters where more than 30% of households are involved in marine dependent activities include Mabatini in Madimba, all of Litembe quarters except Majengo, Migombani in Kilambo, and Magomeni and Pachani inTangazo (mainly fishing). Less than 10% of households depend on marine resources in Shangani, Majengo and Mahiva in Madimba.

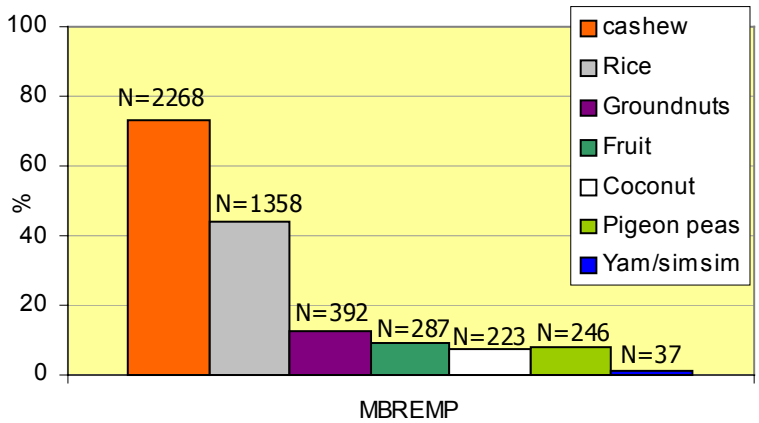
A high proportion of other natural resource dependent households are also found in Pwani (87%), Madimba. These are mostly involved in weaving, however 15% are involved in charcoal production/trading. Other quarters where more than 60% of households depend on such activities, mainly weaving, include Misufini, Msijibu in Kilambo, and Patakuwa in Litembe. The least dependence on other natural resources is found in Tangazo.

There is little variation of dependence on marine resources across the quarters of sea bordering villages. The highest marine dependence is found in Msimbati. Dependence on marine resources is more variable in mangrove villages. The highest dependence is found in Pwani (Madimba), Manyoka in Mitambo, Patakuwa in Litembe. Similarly dependence on other natural resources varies and is particularly high in Pwani (Madimba), Patakuwa (Litembe) and most of Kilambo.

## 2.5. Cash crops in MBREMP

As mentioned in previous sections and shown in map 1, farming is by far the most widely spread activity. Farming is carried out both for subsistence (86% of the listed households) and income (62% of these households). The main cash crops, in order importance, are: cashew nuts grown by more than two thirds of the Park's cash crop farming households, rice, groundnuts, fruit (unspecified but usually mangoes and oranges), coconut, pigeon peas, cassava and sesame.

**Figure 6: Proportion of cash cropping households growing the different crops identified.**

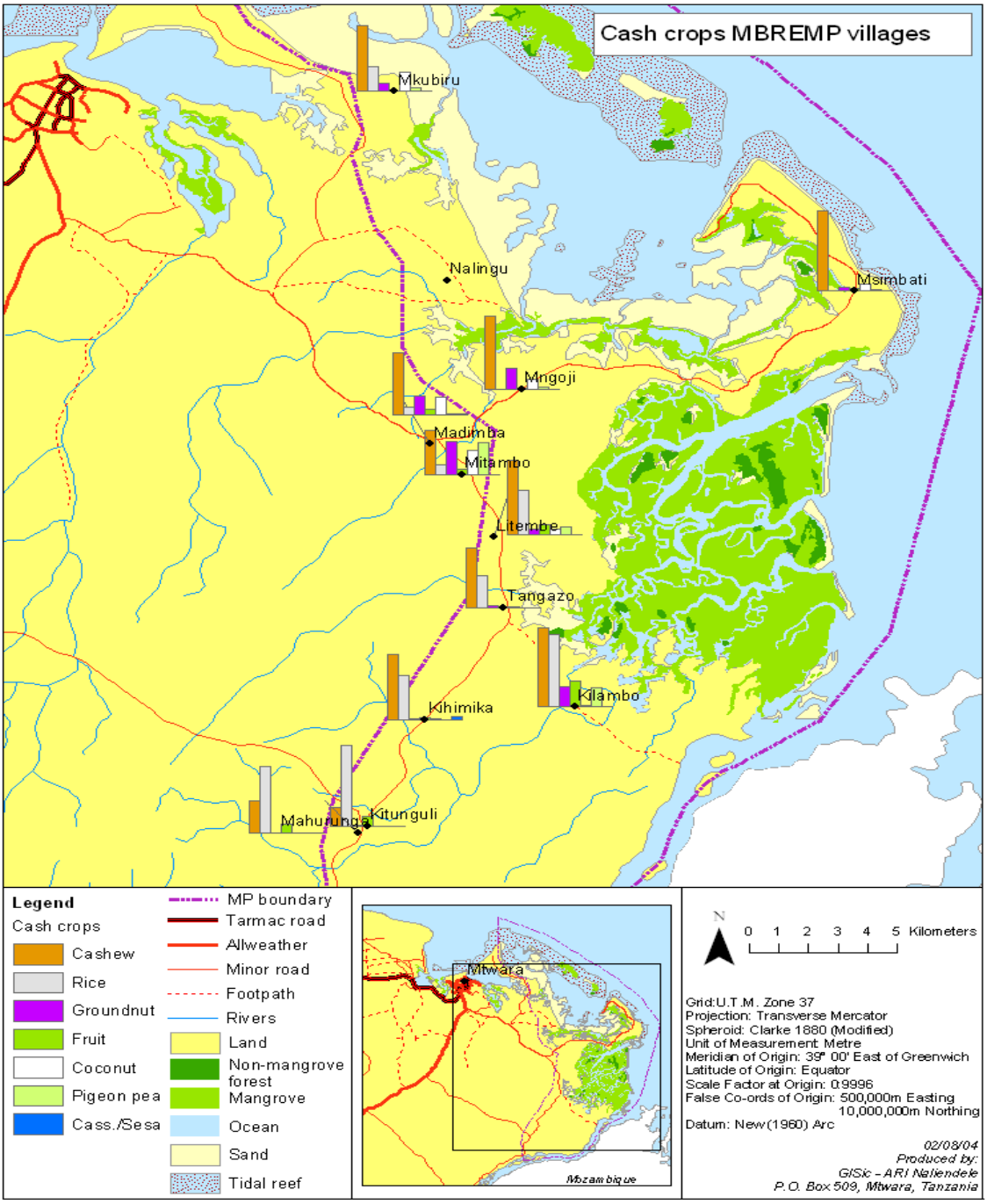



Note: Households farming for income may grow more than one cash crop, thus the total number of households in this figure will exceed the total number of cash cropping households of the Park (2857).

As shown in Figure 6, 73% out of the cash cropping households grow cashew nuts, the main cash crop of the region, 43% grow rice and nearly 13% groundnuts.

However, as for the general occupational structure, cash crops vary across villages. The soil, water and other characteristics that affect fertility will determine which crops can be grown in different locations. Knowledge, exposure (through agricultural extension for example), cultural and historical factors may also have an impact on the type of crops grown (Topper, 2003). Map 3 shows the difference in importance of cash crops across the Park villages.

**Map 3: Crops grown for income at the community level (as a proportion of income farming households)**




As shown in map 3, cashews dominate cash crops in all villages except in the river villages where rice takes the lead.

Cashew is grown by 79% to 95% of the 50% to 68% cash cropping households in the sea bordering villages and dominates by far other crops. However rice and coconuts are also important cash crops in Mkubiru, and ground nuts in Mngoji.

A wider variety of cash crops are cultivated in the mangrove villages except in Tangazo. Cashews dominate (53% in Mitambo to 94% in Kilambo of involved households) but are closely followed by rice in Litembe, Tangazo and Kilambo (52%, 38% and 87% cash cropping households). Groundnuts are also widely spread in Madimba, Mitambo and Kilambo (for more than 20% of households growing

cash crops). Fruit in Kilambo (more than 30% involved households), and coconuts (more than 20% in Madimba and Mitambo). Pigeon peas are mainly grown for sale in mangrove villages by a relatively high number of households particularly in Mitambo and Kilambo (37 and 23% of cash cropping households).

Although cashews are important for the river villages (just above 20% of the households farming for cash), rice dominates by far (87% of these households in Mahurunga and 100% in Kitunguli). Fruit for cash is as widely spread as cashews in the river villages.

Livestock was not investigated in detail, however the data shows that the proportion of households keeping livestock does not exceed 10% in all villages except two of the mangrove villages (Litembe and Madimba). Observations suggest that these are predominantly chickens, goats and cattle, with very few sheep.

Characteristics including soil types and water will affect the type of crops that can be grown. Except for cashews which are widely grown all over the Park, other crops are found to be concentrated in particular villages. In terms of volume, the rice growing area is concentrated in the mangrove (Litembe,Tangazo, Kilambo) and river villages, all of which concentrate about 80% of rice growing households in the Park (excluding Nalingu).

Fruit is dominated by Kilambo which account for more than 50% of the fruit growing Park households. Finally all the households growing pigeon peas for income are concentrated in the mangrove villages particularly in Mitambo and Kilambo.

## 2.6. Focus on marine resource dependent households

The project's main interest lies in marine resource dependent households. If pressure on marine resources is to be reduced, it is essential for the Park management to have a basic knowledge on how diverse marine resource dependent households' livelihood systems are. This will help focus efforts to promote other livelihood options. Although it is very uncommon for a household to depend only on fishing or another marine resource associated activity (see Malleret-King, 2003; Anderson et al., 1998; Malleret-King, 2000; King, 2000), fishing and/or other marine resource associated activities may be the only or main source of income for a large number of households (Malleret-King, 2003).

An indication of the level of dependence on marine resources at the household level will be obtained through a household survey. However, information on the relative importance of marine resources for dependent households could be derived from the occupational structure data.

### 2.6.1. Indication of the level of dependence of “marine households”

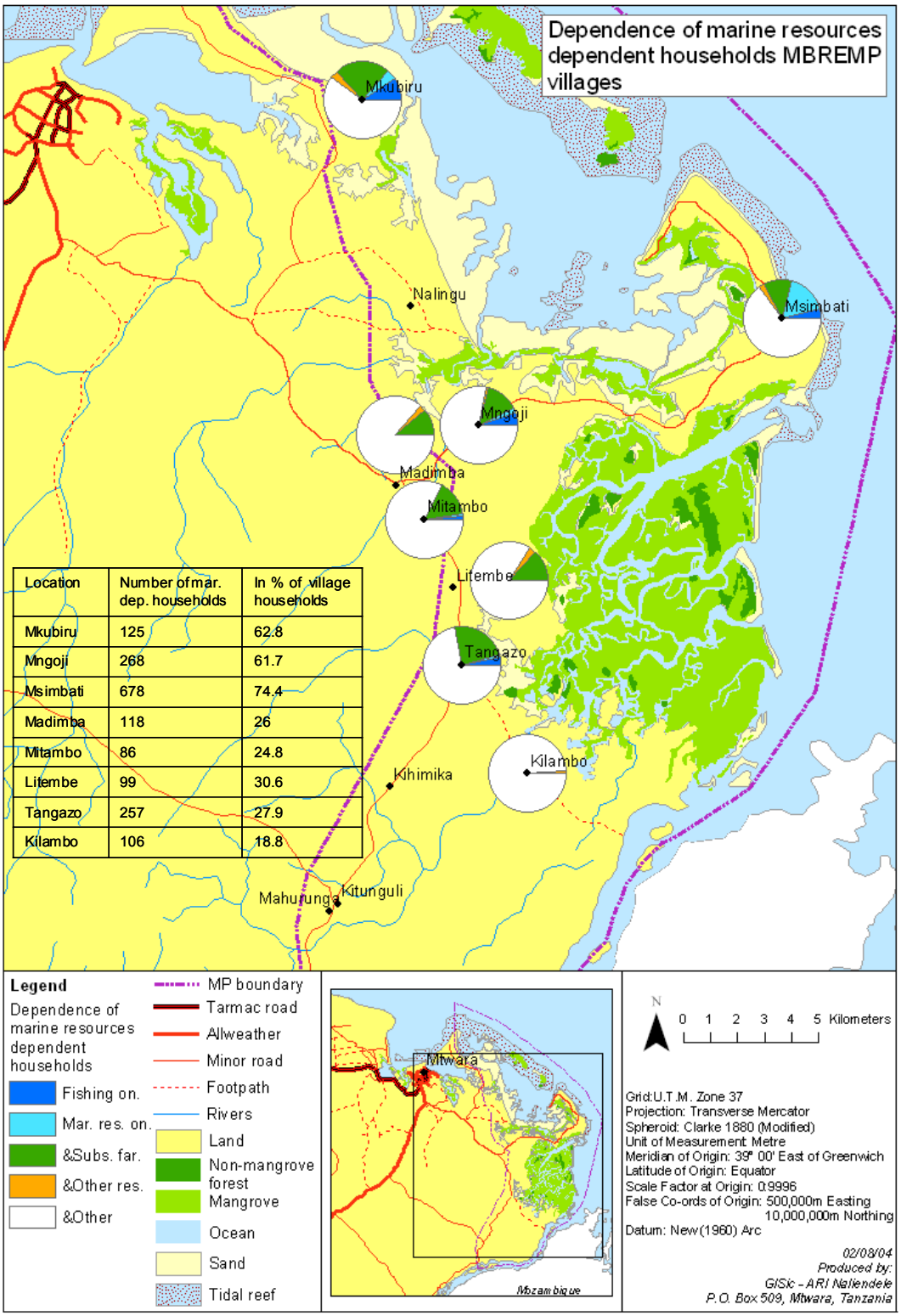
In order to explore further the level of dependence on marine resources; households were grouped into the following categories.

Exclusive dependence on:

- Fishing
- Fishing and/or other marine resource associated activities (sea weed farming, fish trading, shell collection, excluding mangroves)
- Marine resource associated activities and subsistence farming (only source of income provided by marine resources excluding mangroves)
- Marine resource associated and other natural resources activities (including mangrove trading, other wood trading, weaving, hunting etc.)
- Other

Map 4 illustrates the indicative level of dependence of marine dependent households.

**Map 4: Level of dependence on marine resources (income and subsistence) for marine resources dependent households**




| Location | Number of mar. dep. households | In % of village households |
|---|---|---|
| Mkubiru | 125 | 62.8 |
| Mngoji | 268 | 61.7 |
| Msimbati | 678 | 74.4 |
| Madimba | 118 | 26 |
| Mitambo | 86 | 24.8 |
| Litembe | 99 | 30.6 |
| Tangazo | 257 | 27.9 |
| Kilambo | 106 | 18.8 |

The table on the left of the map shows the number of households and proportion of village households they represent.

As illustrated by map 4, few households depend on marine *fishing* only, (9.6% of Mkubiru and 3.8% and 5.2% in Msimbati and Mngoji of the marine dependent households). However, a fifth of Msimbati marine dependent households appear to depend only on *marine resources* for their livelihood (20%), that is fishing only and or/other marine resource associated activities only. This represents a relatively high percentage of the households which would suggest a high vulnerability to any negative change in marine resource exploitation regimes or reduction in the resource base. This figure will benefit from cross checking with the household survey planned for the socio-economic assessment.

Although the proportion of households only dependent on fisheries and other marine related activities is low in most villages, it is relatively high[2] in Msimbati, Mkubiru and Tangazo (mangrove area) where it amounts to a third or more of the marine dependent households.

Marine dependent households relying on other natural resources only represent a small proportion of the households.

Most marine dependent households depend on "other" combinations of activities. Thus the data suggest that the strongest level of dependence on marine resources in terms of subsistence and income is found in the sea bordering villages, particularly Msimbati and Mkubiru, but also in Tangazo (mangrove village).

## 2.7. Marine dependent households' occupational structure

On average, the households' livelihood systems in villages where marine related activities occur (sea bordering and mangrove villages) is less varied than in other villages (river villages and Kihimika).

**Table 2: Average number of livelihood activity categories of marine dependent households and non-marine dependent households, at village level and the comparison.**

| Village | Marine dependent Households | Other households | Village average | T test households (mar. dep. / non-mar. dep.) | Average Village (mar. dep. / non-mar. dep.) |
|---|---|---|---|---|---|
| Mkubiru (sea) | 1.14 | 1.24 | 1.8 | ns | 1.7 |
| Mngoji (sea) | 2.4 | 1.5 | 2.1 | P<0.01 | |
| Msimbati (sea) | 1.9 | 1.4 | 1.7 | | |
| Madimba (mang.) | 2.8 | 1.6 | 1.9 | | |
| Mitambo (mang.) | 2.6 | 1.7 | 1.96 | | |
| Litembe (mang.) | 2.6 | 1.7 | 2 | | |
| Tangazo (mang.) | 2.2 | 1.2 | 1.5 | | |
| Kilambo (mang.) | 2.7 | 1.8 | 2 | | |
| Mahurunga (riv.) | | | 1.8 | | 1.9 |
| Kitunguli (riv.) | | | 1.4 | | |
| Kihimika (other) | | | 2.4 | | |
| MBREMP | 2.03 | 1.34 | 1.73 | | |

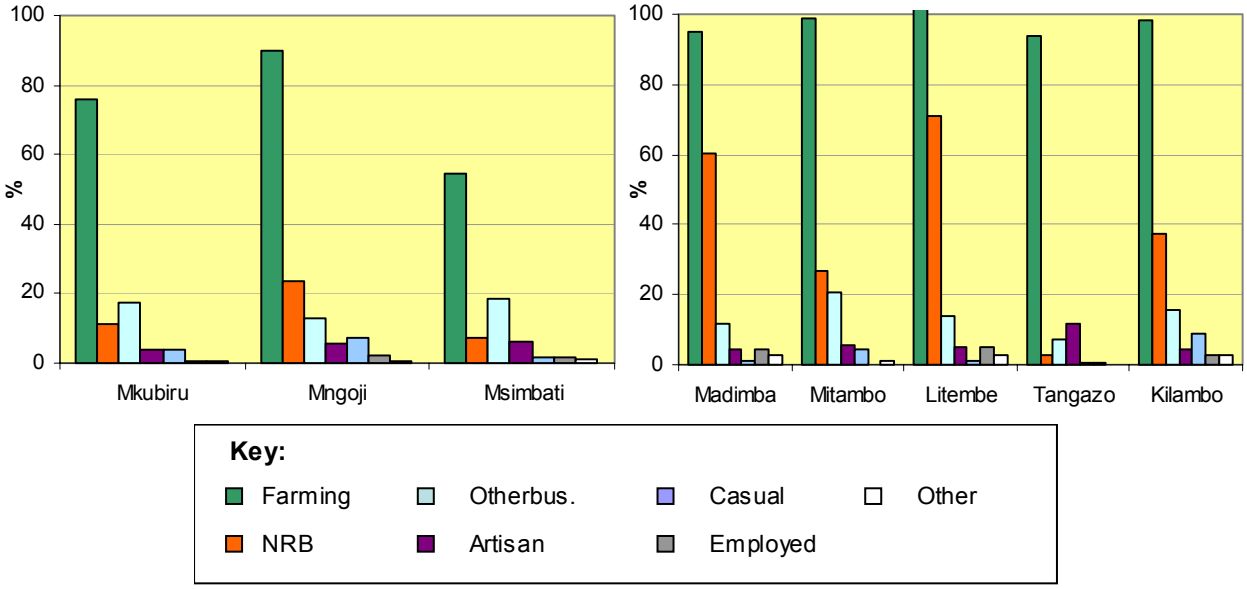
However, marine dependent households depend on average on 2 types[3] of activities for their livelihood, significantly more than non-marine dependent households (1.34 activity categories) in the same village except in Mkubiru.

In addition to their marine associated activities, marine dependent households are usually also involved in farming and in businesses (see Figure 8).

[2] Sum of fishing only, marine resources only and subsistence farming marine dependent households.
[3] Types of activities refer to the 9 categories of activities detailed in Figure 1. (marine, river, other natural resources, farming, other business, artisans, casuals, employed and other).

The majority of marine resource dependent households in the sea bordering villages depend on fishing (more than 80% in Mkubiru and Mngoji), and a high percentage depend on trading fish and other marine products (excluding shells) in Msimbati (55%).

**Figure 8: Occupational structure of marine dependent households at the village level**



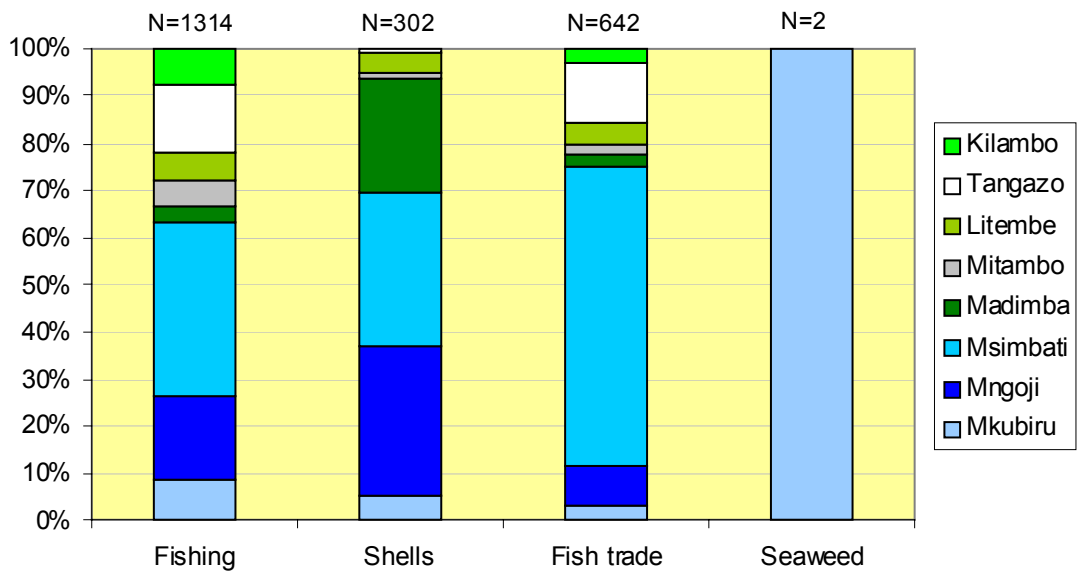

The pattern is relatively similar in Mangrove and sea bordering villages although marine dependent households represent a lesser proportion of the households than in sea bordering villages. Farming is the most widespread activity in marine dependent households, and natural resources exploitation is also important particularly in the mangrove villages. Livelihood strategies of marine resource dependent households are complex and include farming and business components (whether natural resource based or not).

### 2.7.1. Core zones of marine associated activities in the Park

The proportion of households dependent on marine associated activities in each community or quarter indicates the importance of marine resources from the perspective of the communities and or groups within these communities. It also indicates a source of important threats to the marine diversity in the Park. Pressure on marine resources will not only vary according to the dependence of the communities (proportion of households involved) but it will also vary according to the shear volume of households involved. Although this is obvious, both aspects do not always overlap.

Thus, the following section relates the distribution of marine associated activities in terms of number of households involved (note that Nalingu village including Mnazi and Mnete sub-villages are not included, but from observations and preliminary data on fishers, they are likely to have a high number of marine dependent households).

**Figure 9: Distribution of fishing, shell collecting, fish trading and seaweed farming households across the Park.**




As shown in Figure 9, the core fishing areas in terms of numbers are Msimbati (37% of fishing households), Mngoji (17%) and Tangazo (14%). These three villages represent 68% of fishing households in the Park. Most of shell collecting households are located in Msimbati, Mngoji and Madimba which amount to 87% of shell collecting households (respectively 33%, 31% and 23%). Fish traders are concentrated in Msimbati (63% of the fish trading households in the Park) followed by Tangazo (12.5%) and Mngoji (8%).

Due to the number of people exploiting the resources, the highest direct impact on the marine resources (fish and shells) will be expected in Msimbati, Mngoji and Tangazo for fishing and Msimbati, Mngoji and Madimba for shell collecting.

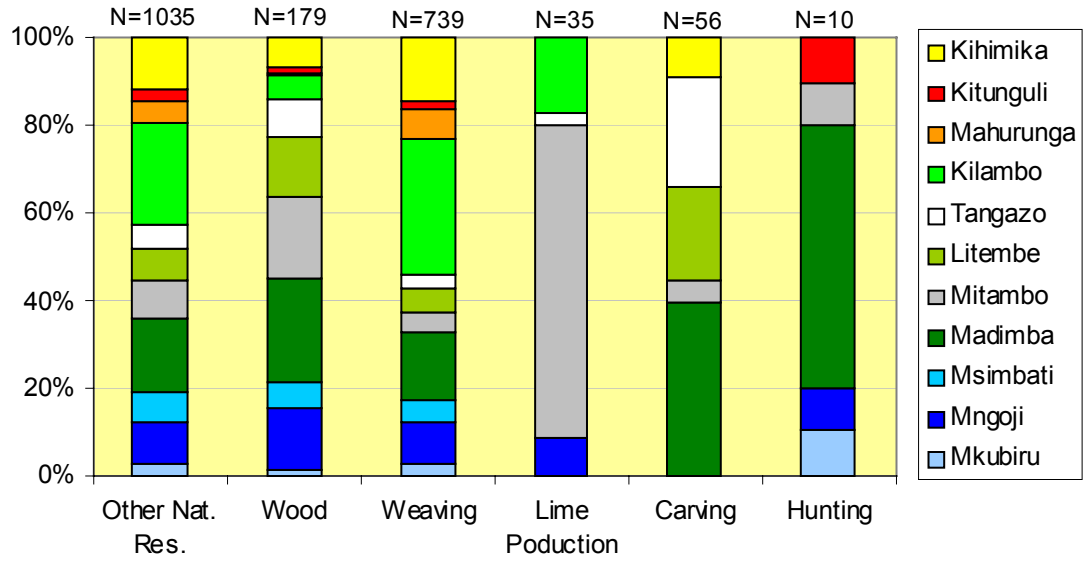
The core fish trading zone is found in Msimbati, second is Tangazo.

## 2.8. Focus on activities of interest

Other activities are of interest to the Park. These include activities that will be directly targeted by the Park management (such as mangrove harvesting and trading, charcoal making, lime production), or activities that may have a potential for being developed as alternative income generating activities and/or have an impact on the Park's marine and non-marine biodiversity (use of wild flora and fauna of the Park for carving, weaving, hunting….etc).

A significant proportion of households are involved in "Other" natural resource dependent activities. However this category is made up of activities that may not represent a large number of households. This could reflect the real situation in the Park or the reluctance of informants to list illegal activities (e.g.: unlicensed charcoal burning, unlicensed mangrove harvesting). However, the information gathered has enabled the authors to show the likely distribution of these activities throughout the Park (Figure 10).

**Figure 10: Distribution of "Other" natural resources dependent households across the Park.**



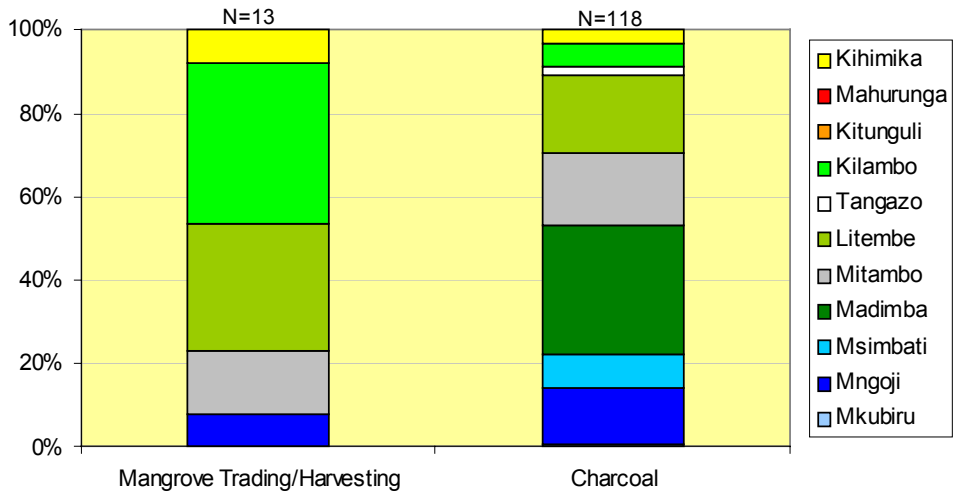

"Other" natural resources associated businesses are widespread within the Park (including weaving, wood related activities, hunting, salt production, traditional plant medicine etc). The larger proportion of natural resources dependent households are operating in Madimba, Kilambo and Kihimika. The two most widespread "other" resource associated activities are weaving (739 households) and wood trading including charcoal, firewood, timber and mangrove wood (179 of listed households involved).

Most of the 56 carving households are concentrated in the mangrove area in Litembe, Tangazo and Madimba (85% of carving households). Lime producing households (35) are concentrated mainly in Mitambo and Kilambo. It is believed that lime production in these villages is not coral based but produced from shells (Guard, pers. comm.). Further information would need to be collected on this activity. When investigated further, it was found that the main lime production/trading area are Matondo and Mnyoka in Mitambo (11.3% and 9% households involved).

Hunting was mentioned for only 10 households, 6 of which are located in Madimba.

Figure 11 illustrates the distribution of mangrove and charcoal related activities in the Park.

**Figure 11: Distribution Mangrove harvesting/trading and charcoal producing households across the Park.**



As shown in Figure 11, mangrove harvesting and/or trading was mentioned mostly in Kilambo, Litembe and Mitambo. Although it is believed that most villages in the Park exploit mangroves (Mr Machumu, pers, comm.), this was not identified clearly in the occupational structure. Informants may have been reluctant to mention activities which may be carried out illegally.

Another activity of interest to the Park, emphasised in Figure 11, is charcoal burning. Households involved in charcoal making and/or trading represent 49% of wood exploiting households (a total of 118 households). Charcoal making is widespread but is mainly the activity of the mangrove villages (Madimba, Mitambo, Litembe) and sea bordering Mngoji.

Activities such as mangrove cutting or live coral lime production will not have been picked up at this level. It is known from the mangrove assessment (Wagner *et al.*, 2004) that lime production based on live coral was being carried out in Ruvula (Msimbati), this was not mentioned by the key informants.

# 3. Discussion and recommendations

## 3.1. Dependence on marine resources and extent of use

Informants gave information on 4958 households for 11 out of the 12 villages. This is expected to represent a high percentage of Park households.

One of the main limits of this study is the lack of information on Nalingu which includes one village and three sub-villages (Nalingu could represent up to 5000 people). Observations by Park staff and preliminary surveys of fishers suggest that Nalingu is one of the main fishing villages in the Park. This lack of information probably contributes to underestimating the dependence on marine resources, and importance of seaweed farming at the Park level. However most of the information was investigated at village and quarter levels thus high dependence zones could be identified in the remaining areas.

The occupational structure data enabled activities carried out in the Park to be mapped, and their importance and distribution determined. On average Park households depend on 1.7 categories of activity (see table 3). Marine dependent households depend on a higher number of activity categories (1.9 in Msimbati to 2.8 in Madimba) than non marine dependent households (1.4 on average), with the exception of Mkubiru (where the difference is not significant).

A wide array of activities are carried out including fishing (river and marine), fish trading (river and marine), seaweed farming, weaving, charcoal making, craft making, traditional medicine, small businesses, and artisans. The portfolio of existing activities in the MBREMP is similar to activities identified in other coastal villages in East Africa (Malleret King *et al.*, 2003; Malleret-King, 2000).

Farming is the most widespread activity in MBREMP (86% of households listed by the informants), both for subsistence and income. Marine dependent activities, including seaweed farming but excluding mangrove harvesting, are second with 35% (1737 households) of listed households involved. Thirdly comes “other” natural resources dependent activities (21% of listed Park households involved), mainly weaving, wood (including mangrove) trading and harvesting. Wage employment is uncommon and is a source of income for less than 5% of the Park households listed.

The overall dependence on marine resources is significant at the Park level; 35% of households are directly dependent and a further 1.5% of households are indirectly dependent on marine resources (net makers and menders, trap makers and fishing boat builders). These results are comparable with findings for other parts of the East African coast. For example, in the north coast of Kenya (Malleret-King *et al.*, 2003, Shao *et al.*, 2003) 43% households were found to be dependent on marine resources. Other Tanzanian sites (around Bagamoyo) were found to be more dependent with 68% of households depending on marine resources for their livelihood (Malleret-King *et al.*, 2003).

However the occupational structure, and especially the dependence on marine resources, shows high geographical variation across MREMP. Four different groups of villages could be identified on the basis of their distance from: the sea, the Ruvuma River, or the mangrove/estuary area. Thus giving

sea bordering villages (Mkubiru, Mngoji, Msimbati, Nalingu), mangrove villages (Madimba, Mitambo, Litembe, Tangazo, Kilambo), River villages (Mahurunga, Kitunguli), and other (Kihimika) (see Map 1).

Although the dependence on marine resources at the Park level seems lower than in other parts of the Tanzanian coast such as Bagamoyo, this is not the case if only sea bordering villages are considered, in which case the results are comparable. Indeed, it was found that 63 to 74% of sea bordering village households in the Park depend on marine resources (+/- 1 or 2% for activities indirectly related to exploitation of marine fisheries resources). This comparison is possible as sites selected by Malleret-King *et al.*, (2003) in Bagamoyo were representative fishing villages, with similarly easy and direct access to the sea.

Fishing is the main marine related activity, followed by fish trading. Marine fishing households amount to 26.5% (1314 households) of the total listed MBREMP households (excluding Nalingu which is expected to have a high number of fishing households). The proportion of fishing households in sea front villages is homogenous and represents just over half of the households (53 to 56%). This is consistent with findings in other parts of Tanzania and in Kenya. 54% of the communities' households around the Kisite Marine Park in southern Kenya depended on marine fishing (Malleret-King, 2000) and 55% of households in Bagamoyo fishing villages depended on marine fishing (Malleret-King *et al.*, 2003).

Fish and other marine products traded (excluding shells) are mainly fresh fish and small dried fish. Octopus trading is particularly found in Msimbati. Overall 13% of households are involved in fish and marine products trading across the Park and 31% of households in sea front villages. This latter figure is high compared to findings of other studies (16.5% households were found to trade fried and dried fish in Tanzanian sites by Malleret-King *et al.* (2003) with an added 2 or 3% for other types of fish traded). Fish trading activities would benefit from further investigation because it is believed to be underestimated in some instances, such as where there is a very low occurrence of dried fish trading (mainly carried out by women). An exception to this is the very high dependence on fish trading at Msimbati, which appears to be a core market/trading area for fish, octopus and sea cucumbers (45% of households are involved). The figure in Msimbati is believed to be overestimated.

General dependence on marine resources is lower in mangrove villages (from 19% of households in Kilambo to 32% in Tangazo), mainly from fishing. However, dependence varies at the quarter level and is very high in some quarters (more than 50% of Madimba's households in Pwani), Litembe (Patakuwa) and Mitambo (Maniyoka). The high dependence in Madimba and Mitambo quarters is due to the large proportion of households involved in shell collecting and trading.

Marine resource dependent people often depend on a variety of activities. In MBREMP this is mainly farming, and other natural resources dependent activities and/or other business. However, although few marine resource dependent households depend solely on fisheries resources for their livelihood, up to 13% do in Mkubiru and 20% in Msimbati (dependent on fishing only or on marine resources only). Furthermore, for an important number of households marine resources represent the only source of income (see map 4). 30% of the sea front marine dependent households rely solely on marine related activities for their income (fishing only, marine resource only, and subsistence farming); 36% in Mkubiru (74 households), 33% Msimbati (298 households) and 21% in Mngoji (92 households). This percentage is much lower in mangrove villages (17 % on average) except for Tangazo where 28% of marine dependent households rely only on marine resources for their income (260 households).

Marine resources are most important for Msimbati, Mkubiru, and Mngoji with more than 60% of the listed households involved in marine related activities (table 4). The strongest dependence on marine resources (where households depend only on marine resources for subsistence and/or income) is found in Mkubiru, Msimbati, Mngoji and Tangazo. These villages are likely to be the source of the main pressure on marine resources (note that Nalingu is likely to be similar due to its geographic location).

The largest numbers of households involved in marine resources related activity are located in: Msimbati, Mngoji, Tangazo and Mkubiru. Table 4 shows how villages rank in terms of dependence on marine resources, and number of households involved in marine resource associated activities. This can be related to the degree of impact on marine biodiversity.

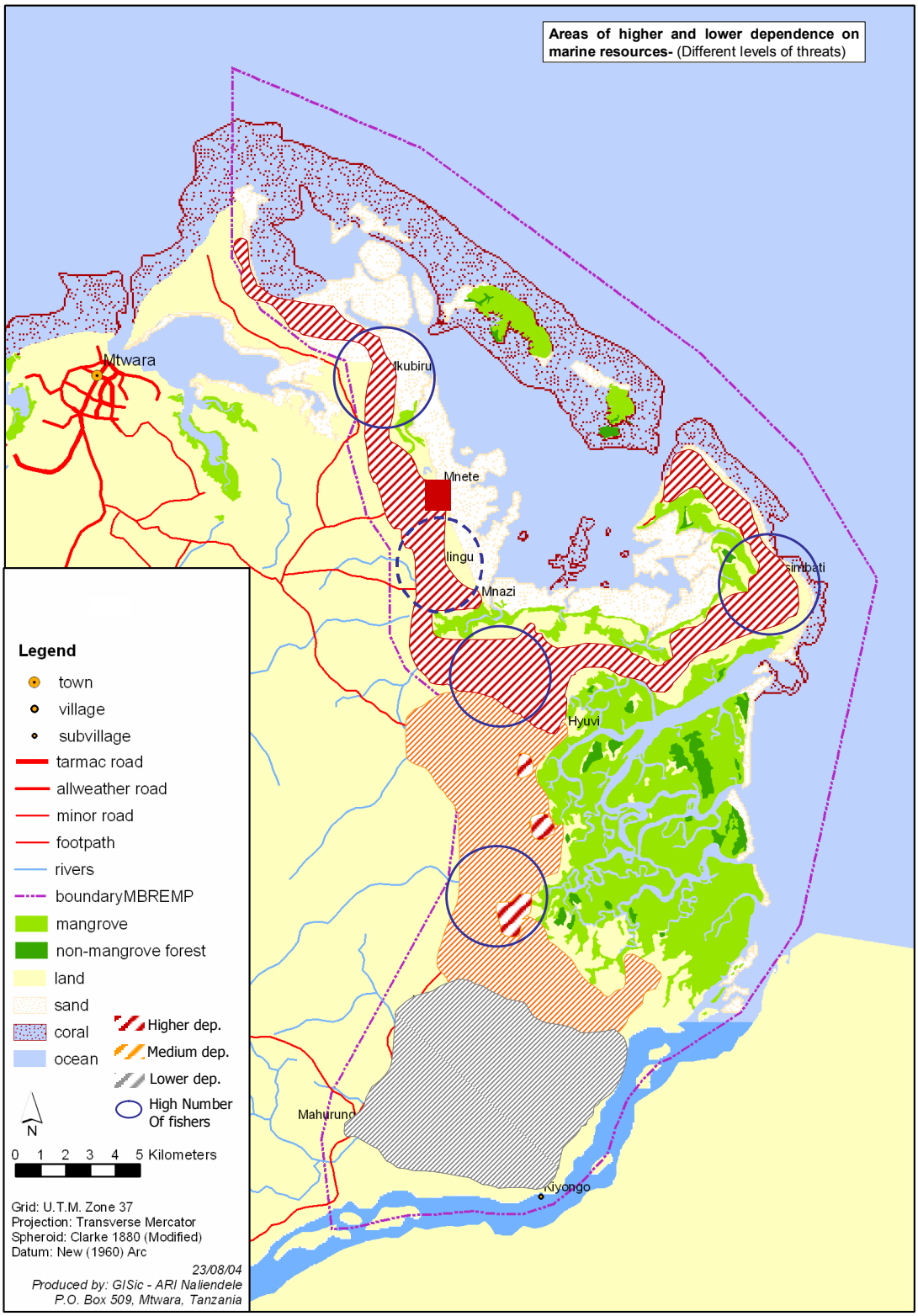
**Table 3: Summary of core villages in terms of volume (actual number of households involved) and importance to the communities (% of households involved).**

| **Importance of marine resources for the communities (% of households involved)** | | | | |
|---|---|---|---|---|
| Rank | Fishing | Trading | Shell coll. | Overall |
| 1 | Mkubiru | Msimbati | Mngoji | Msimbati |
| 2 | Mngoji,Msimbati | Mngoji | Madimba | Mngoji, Mkubiru |
| 3 | Litembe | Mkubiru | Msimbati | Litembe, Tangazo |
| **Strength of dependence (% households solely depending on marine resources for income and or subsistence)** | | | | |
| Rank | Relying solely on marine res. for income and subsistence | | Relying solely on marine resource for income | |
| 1 | Msimbati | | Mkubiru | |
| 2 | Mkubiru | | Msimbati | |
| 3 | Mngoji | | Tangazo | |
| **Volume of activity (actual number of households involved in marine related activities)** | | | | |
| Rank | Fishing | Trading | Shell Collecting | Overall |
| 1 | Msimbati | Msimbati | Msimbati | Msimbati |
| 2 | Mngoji | Mngoji | Tangazo | Mngoji, Tangazo |
| 3 | Tangazo | Madimba | Mngoji | Mkubiru |

Although Mkubiru comes second and first in terms of importance of marine resources for the village (involvement in marine related activities, and reliance on marine resources for income and subsistence), it comes third in terms of the volume of households it represents.

Understanding the importance of marine resources at the village level is essential for the Park to predict where threats and pressure on marine resources come from. From the point of view of Park management it also identifies the areas where activities will need to be focused so that households' socio-economic status does not decrease and household vulnerability increase as a result of implementing Park activities. Similarly areas where a high number of households carry out marine associated activities will need priority attention from Park management. Core areas of pressure are illustrated in Map 5.

**Map 5: Core areas of dependence on and level of marine resources associated activities**



Map 5 illustrates the relative importance of marine resources for the different areas in the Park. The importance of the marine resources from the point of view of the households' livelihoods is high on seafront areas, medium in the mangrove areas and relatively smaller in other villages (in terms of proportion of the communities' households involved). These areas are shaded in red in map 5 (red most dependent to grey least dependent). Villages circled in blue highlight areas where the highest number of marine dependent households were found. Quarters of Madimba and Litembe where dependence is high are also highlighted in dark orange (see Map 5 & Figure 5). Areas on the map corresponding to quarters are only tentative as there has been no ground-truthing of village boundaries. Although no data could be gathered on Nalingu in the context of the occupational structure, discussions with the Park team and local stakeholders, suggest that Nalingu is one of the main fishing village in the Park. Nalingu area has thus been represented in red on map 5, by extrapolation. It also has been circled in blue (dotted line) to indicate that a high number of fishers is likely to be based in Nalingu village. Shaded zones point out the general areas where most (or least) threats to the marine resources are likely to come from. They are not precise geographical representations. Map 5 thus illustrates that the areas where the need for special focus is Msimbati, Mngoji, Mkubiru, Tangazo, and probably Nalingu..

Finally, although not investigated through the occupational structure, it is important to note that the dependence on marine resources extends to more than marine resources exploiting households. The wider community also depends on marine resources as a source of animal protein (coastal people in Tanzania depend on marine resources for 60% of their protein intake, Shao *et al.*, 2003). These people will also be affected and need to be considered when management decisions are implemented in the Park. Thus, attention needs to be drawn to changes in fish prices, and other marine products used for local consumption which might affect households' access to animal proteins.

The observation that marine resources are highly impacted by human activities, particularly fishing was made during the marine biodiversity assessments carried out in the Park (Obura & Church pers. comm., Obural *et al*., 2004., Richmond pers. comm.), this was also a found in Guard *et al*. (1998) and by UNDP/GEF (2000). The occupational structure of Park villages shows that the dependence on marine resources is high particularly in MBREMP sea front villages and some quarters of mangrove villages. Fishing and shell collection intensity is likely to be high based on the numbers of households involved, thus perpetuating marine biodiversity degradation in these areas. It should be recognised that Park management activities that seek to reduce pressure on the marine environment will need to be accompanied by mitigating measures for households in core dependent areas, as these will be impacted the most by such actions.

## 3.2. Dependence on other natural resources in the Park

The dependence and exploitation of other natural resources (non marine and non riverine resources) was also investigated because marine biodiversity may depend on these resources for its integrity (e.g. mangroves, coastal forest) and health. Therefore an indication of the level of threat to these other natural resources is useful for Park management, but also because 2/3 of the Park is land and such resources would be expected to be of socio-economic importance. The whole Park environment is of importance from an ecological and an economic perspective, and should be considered holistically from the point of view of Park planning and management. For example terrestrial, coastal and marine resources may have value in terms of tourism development potential be it birds, trees, special plants, intrinsic beauty and so on.

Finally, information on these other natural resources will also be of use from the perspective of the development of alternative or supplementary income generating activities (in the context of reducing pressure on marine resources), where alternative opportunities could be identified.

Dependence on "other" natural resources is high all over the Park and particularly in mangrove villages and Kihimika. More than a third of the households in Madimba, Kilambo, and Kihimika depend on these “other” resources for a living. The highest number of households depending on such activities are also found in these three villages (see Table 5). Indirect or direct exploitation of these "other" natural resources include mangrove harvesting and trading (not separated in the data), lime production (potentially from shells), charcoal burning, weaving of palm fronds and other craft making (such as wood carving).

Although numbers of households involved in mangrove harvesting/trading and charcoal burning is likely to be underestimated due to issues of the legality of these potentially destructive activities, information was still obtained. The highest number of households listed as involved in mangrove harvesting and/or trading was found in Kilambo.

Core areas for charcoal trading/burning are in order of importance, Madimba, Litembe, Mitambo and Mngoji. Finally results suggest that lime production which, according to the data, is not widespread in the Park would be concentrated in Mitambo. Although numbers are not high, these activities may have a high impact on resources particularly because shells and live coral are the traditional source of lime. This information needs cross checking and further investigation in order to determine the level of exploitation of these resources.

**Table 4: Summary table on dependence on "other" natural resources associated activities, particularly potentially destructive activities (core villages in terms of number of households involved and core villages in terms of proportion of households involved).**

| **Importance of other natural resources for the communities (% of households involved)** | | | | |
|---|---|---|---|---|
| Rank | Overall | | | |
| 1 | Kihimika, Kilambo | | | |
| 2 | Madimba | | | |
| 3 | Mitambo | | | |
| **Level of activity (actual number of households involved in other natural resource exploitation)** | | | | |
| Rank | Mangrove | Charcoal | Lime | Overall |
| 1 | Kilambo | Madimba | Mitambo | Kilambo |
| 2 | Litembe | Litembe, Mitambo | | Madimba |
| 3 | | Mngoji | | Kihimika |

## 3.3. Farming

Results show that farming is the most widespread activity. The high importance of farming activities in livelihood systems of East African coastal communities is underlined in other studies (Malleret-King 1996; Malleret-King, 2000; Shao *et al.*, 2003).

Detailed information was sought on farming activities in this study because of their importance to the Park villages but also because they constitute a potential path for exploring alternative livelihood options. For example, improving farming techniques and increasing farming productivity was suggested as a way of reducing pressure on marine resources in southern Kenya and northern Tanzania (Malleret-King, 1996), including controlling crop damage by bush pig in Tanga (Dr Verheij, pers. Comm.). 86% of the Park households farm in one way or another, 62% farm for cash (including the sale of local crops at the local level). Crops grown for income are mostly cashews, rice and groundnuts. Table 6 summarises crop importance (in terms of number of households growing them) according to village type.

**Table 5: Summary importance of crop according to village groupings**

| Rank | Sea bordering villages | Mangrove villages | River villages and Kihimika |
|---|---|---|---|
| 1 | Cashews | Cashews | Rice |
| 2 | Groundnuts | Rice | Cashews |
| 3 | Coconuts | Groundnuts | Fruit |

Cashews represent the main cash crop across the Park.

## 3.4. Further research

The role of the occupational structure was to provide an indication of the extent of dependence on marine resources at the community and sub-community levels, on the variety of activities carried out in the Park, and establishing a sampling frame of the Park households for future research. By identifying areas of core dependence on marine resources, the occupational structure will contribute to helping the Park focus its activities. However, to develop strategies to achieve sustainability of resource uses, zoning activities and developing alternative income generating activities which are all part of the Project's objectives (UNDP/GEF, 2000), a number of aspects need to be researched further. These are listed in the section below.

For ease of presentation, suggestions for further research are separated into four groups, however some of these overlap.

### 3.4.1. From the point of view of zoning activities in the Park

One of the GEF/UNDP project objectives is to reduce pressure on marine resources by reducing impacts of destructive fishing. Part of this will be achieved by zoning activities (establishing core biodiversity conservation areas as no-take zones, specified use areas, etc). To do this, more information needs to be gathered on marine stakeholder (direct and indirect) use patterns and their socio-economic status including:

- Gear use in terms of proportion of users and numbers (part of this information will be gathered through a fisheries study already started by the Park team). Choice criteria for fishing gear and main constraints to using gear identified as less destructive.
- Location and timing of fisheries related activities including shell collection, particularly in core dependence zones (map 5).
- Main species exploited and traded.
- Indication of income generated by marine resources and importance of this income in relation to other activities.
- Relative socio-economic status of marine resource dependent households, particularly in relation to the level of dependence on marine resources or gear used. Lack of finance is often a cause for using destructive fishing gear which does not require capital investment. This was one of the reasons for the use of beach seines in Kenya and Tanzania (Malleret-King *et al.*, 2003). A wealthy (*tajiri*) person owns the nets and boats, newcomers to the fishery are simply labour and get a share of the catch.

  This information will help the Park management to develop focused strategies and take account of the most vulnerable marine dependent households when establishing a zoning strategy. The Park needs to know who the stakeholders are and who will be affected by some of the zoning decisions. The occupational structure has provided a first step towards giving an indication to the Park of the areas which will need special attention.

- User based conflicts. This will contribute to providing baseline information on relationships amongst marine users and other stakeholders (e.g. Park management, other government departments etc). This information could be the basis of some of the zoning strategies. It will also provide the Park with key information on the likely impacts of some decisions, particularly in terms of involving particular groups and not others in some activities.

Some of these topics were investigated in focus group interviews and a household survey carried out within the context of the socio-economic assessment of the Park and is presented in a separate socio-economic assessment report.

### 3.4.3. Sustainability

One of the objectives of the Project is to achieve sustainable use of the resources in the Park. To achieve this, more socio-economic information needs to be collected on both marine and other natural resources. Such as:

- **Current use of marine resources**. Indications of overfishing and ecosystem damage have already been found in terms of coral damage and scarcity of predatory fish (Obura *et al.*, 2004), scarcity of holothurians (Richmond pers. omm.) during biodiversity assessments. However further information on the sustainability of fisheries and shell collection is needed, and an indication of how users themselves (fishers, shell collectors…) see how the status of resources have evolved over time (in the last few decades) (indication of trends in catch in the last decades and the perceived threats to resources from the stakeholders' perspective).
- Current level of use and benefits of exploiting other resources:
    - MBREMP **mangrove forests** were ranked as some of the best in Tanzania by the team who undertook the mangrove assessment for the Park (Wagner *et al.*, 2004). However human impacts are already noticeable and it was found that some areas already have shown a shift in species dominance due to exploitation. More information on sustainable rates of exploitation, cost/benefits of harvesting mangroves, numbers of households involved, their perception of the resources, management strategies would be useful to determine a management strategy. Some of this information has already being collected in the mangrove assessment (Wagner *et al.*, 2004).
    - Similarly, further information is needed on **wood carving** (likely to use precious or limited wood resources in the Park), and **weaving**, particularly species harvested, amount used, cost/benefits of using these resources. More information on a sustainable rate of exploitation is needed.
    - Although little information was obtained on lime production due to the illegality of this activity, lime kilns were identified by the mangrove assessment teams, this would benefit from further investigation.
    - **Charcoal production**. Cost and benefits of this activity, extent of the activity, species used, amount used etc. A joint study on charcoal and other wood uses may be considered with Naliendele Agricultural Research Institute, particularly the Soil Conservation programme could be approached.

All the resources mentioned above, marine, wood resources including mangroves are part of the Park's ecological and economic patrimony, particularly if tourism is to be developed and diverse livelihood options are to remain. Achieving sustainable use of natural resources is thus essential, not only for marine resources, but for livelihoods as well.

### 3.4.3. Further research in the context of AIG activity development

It is widely acknowledged that a good start to exploring potential AIG activities is to understand the livelihood systems and constraints of households, to look at established activities being carried out, and to investigate whether their potential is fully realised. If an activity can be carried out sustainably (see research proposed in section 3.4.2.), or is already sustainable, the question is, are the benefits to households optimised? This works on the assumption that if it is worth it, people will increase time spent on non-marine activities, particularly so if they already are involved in these activities. If AIG activities are proposed in order to reduce specific marine resource exploitation activities, the benefits of these AIG activities will have to match or exceed the benefits from the currently targeted activities at the household level.

In the case of the Park, developing AIGs will only be of value if they contribute to reducing pressure on marine resources and contribute to increasing or maintaining households' economic status in the Park. The conditions for success of AIG activities (i.e. marine dependent households switch from marine resource exploitation to other activities in a long-lasting way and are better off) need to be investigated further. This has been explored by a regional study supported by IUCN (Ireland and Baker, 2004).

Further research is necessary to decide which activities may have potential for supplementing household income. However, the results of the occupational structure would suggest that attention should be drawn to:

- Farming. Farming is the most widespread activity in the area. Cashew is the most important cash crop in the Mtwara Region (Topper and Kasuga, 2003 ). Research should focus on increasing the value of cashew nuts captured at the local level in the Park particularly through sourcing different markets, improving quality, diversifying processing (taking account of the Parks' remoteness, looking at appropriate technologies). Research could also concentrate on other crops (e.g. fruit) in order to increase the added value as well as yields. Background research may already have been carried out by the Naliendele Agricultural Research Institute with which the Project could team up. Other potential synergies on this research could be sought through collaborating with Mtwara Development Corridor Initiatives, and also locally based NGOs with experience in income generating activities such as VSO (Voluntary Service Overseas). The Mtwara Development Corridor Project initiative is interested in finding opportunities for investment and development in the Region. A study will be commissioned on the Cashew sector in Mtwara (Smith, pers. omm..). One of VSO priorities is to develop business opportunities for local people (VSO country coordinator, pers. omm...). The potential partnerships are worth exploring.

- Similarly, further research should be done on the potential market for local artefacts (as suggested in section 3.4.2), how to optimise benefits and increase the value captured at the local level at sustainable levels of exploitation. Research on potential markets, access to these markets, quality levels required etc., particularly woven artefacts. This study could be done jointly with ADEA (African Development through Economics and the Arts), a small local NGO which was set up in the course of year 2003 and which objective was to help local artisans (painters, carvers, tailors, weavers) improve the quality of their products and access the American market. Collaboration with VSO should also be considered. VSO as mentioned above, is currently active in the area and focuses on business opportunities, particularly through the Fair Trade initiative.

- Finally, resource use patterns and the cost/benefits of seaweed farming should be investigated as suggested in section 3.4.1. Seaweed farming is an activity which is often seen as a good alternative income generating activity for coastal people. Seaweed farming has been successful in some parts of the world (Ireland and Baker, 2004) to reduce pressure on marine resources. However success has been inconsistent in East Africa. In Kenya, despite several projects initiated, no farming is going on, similar findings were obtained in Bagamoyo (Malleret-King *et al.*, 2003). It would be useful for the Park to investigate the main constraints to seaweed farming from the perspectives of the farmers. Although introduced in the Park area a few years ago, the level of uptake of seaweed farming is low. It is suggested however that this uptake is higher in Nalingu which was not included in this study. This probably will be looked at by the IUCN study on sustainable alternative livelihoods mentioned above.

### 3.4.4. Other: Transboundary considerations

As mentioned in earlier sections, fish trading needs to be further investigated. Focus however must be put on Msimbati where it was found that 44% of households were involved in fish trading, mainly fresh fish and octopus. This figure needs to be cross checked. Furthermore, Misimbati appears to be the main fish and other marine products (particularly sea cucumbers, pers. obs.) market, and it is known that some of these products come from Mozambique, possibly illegally. It would be necessary for the Park to research the extent and value of this trade at the local level particularly because of the Park's proposal to support a trans-frontier conservation area with Mozambique (King, pers. comm.), which could have implications for the long-term availability of these products for Park households. This has partly been investigated through focus group interviews in the context of the socio-economic assessment.

### 3.4.5. The long term: Monitoring

Socio-economic monitoring is being initiated in the region to improve the management of coastal resources (SEMP-CORDIO). One indicator recommended from the SEMP-CORDIO experience is occupational structure.

Monitoring the Park's occupational structure would be used to know how dependence on marine resources evolves over the years, thus indicating levels of marine resource use and pressures on marine resources. It would also contribute to evaluating the uptake of alternative income generating activities promoted by the Park. This information complements well biophysical information on the health status of resources or ecosystems.

From a practical point of view and to identify long-term change the monitoring should be done every 3 to 5 years, and only on sampled villages rather than all villages, so that the volume of data gathered can be managed by the Park staff.

# 4. Conclusion

A wide array of livelihood activities are carried out in the Park. Marine resources provide subsistence and income to 35% of the Park households, and rank as the second most widespread category of activity after farming. Fishing accounts for most of the marine dependent activities carried out by households, and is followed by fish trading (very important in Msimbati), shell collection and seaweed farming.

Results suggest that the Park communities are highly dependent on marine resources, particularly in the sea bordering villages where 30% of households appear to depend only on marine resources for their income. Dependence may be higher if information on Nalingu could have been incorporated.

Reducing pressure on marine resources through management interventions will have to be accompanied by mitigating measures to safeguard household food security, such as compensation, developing alternative sources of income. There should be special focus on the most vulnerable communities (most marine resource dependent communities) identified in this report.

Pressure on other natural resources also needs to be taken into consideration as impact from human activities is likely to be strong based on the numbers of households involved. Results suggest that 20% of the Parks' households depend on these other natural resources (mainly wood, including mangrove, and other flora and fauna).

This study illustrates the diversity of activities which contribute to the livelihood systems of the villages, quarters and marine dependent households'. It also has shed light on the core areas of dependence and/or level of exploitation of marine resources: Mkubiru, Msimbati, Mngoji, Tangazo, Pwani from Madimba, and Patakuwa from Litembe (see map 5).

Core focus areas for Park management have been identified on the basis of the occupational structure data and a sampling frame has been established. Further information on the following aspects is necessary to enable management strategies to be developed:

1. Marine related resource use patterns
2. Socio-economic status of marine dependent households
3. Conflicts between marine resource users and other stakeholders
4. Other resource dependent activities from the perspective of sustainability of exploitation and/or development of alternative income generating activities (e.g. mangrove harvesting, charcoal production, lime production, weaving, carving, farming).

Aspects 1, 2 and 3 were partly investigated through a separate socio-economic assessment and information will also be gathered through the fisheries assessment. Partnerships and collaboration with institutions, projects and organisations are also suggested as a means of meeting the Park/Project's objectives. These include the Mtwara Development Corridor project, VSO, and Naliendele Agricultural Research Institute.

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# 6. Appendices

## Appendix A. Terms of Reference for the Occupational Structure Consultancy

**UNDP/GEF Development of Mnazi Bay – Ruvuma Estuary Marine Park Project**

**Terms of reference for the analysis and write-up of the occupational structure survey carried in Mnazi Bay – Ruvuma Estuary Marine Park (MBREMP).**

### 1. Introduction

Understanding the livelihoods of the people living within MBREMP is a key project activity. This understanding will support the development of the General Management Plan for the park and inform the development of possible supplementary/alternative income generating activities and sustainable resource use regimes within the park.

The project, with guidance from the regional Socio-economic Monitoring Project (SEMP) managed by the Coral Reef Degradation in the Indian Ocean project (CORDIO), initiated the process through an assessment of occupations carried out in households within MBREMP. This work was carried out in mid 2003 and a significant amount of data was collected. Analysis of the information is required and the results reported in order to provide information on the diversity and importance of livelihood activities within MBREMP. The results will play a key part in developing the General Management Plan by identifying the needs for more focused studies, and will also contribute to developing sustainable resource use regimes and identifying options for supplementary or alternative income generating activities to reduce pressure on marine and coastal resources.

### 2. Background

Mnazi Bay – Ruvuma Estuary Marine Park was gazetted in 2000 having been identified as an area of biodiversity value at both the national and international level. The development of the park is being assisted through a GEF/UNDP funded project initiated in 2002, which will continue to the end of 2006. The project is a partnership between the Marine Parks and Reserves Unit of the Ministry of Natural Resources and Tourism, IUCN – The World Conservation Union and UNDP/GEF.

MBREMP is located in Mtwara rural district where livelihoods are known to be dependent on locally available natural resources. The park covers approximately 200sqkm of sea and estuary and 400sqkm of land area. The large land area ensures that the 10 villages and 5 sub-villages that have traditionally depended on the marine resources of the park are included within the park and are an integral part of management decision making and other park activities.

### 3. Objectives and outputs of the consultancy

The aim of the consultancy is to complete the analysis of the occupational structure data collected by MBREMP staff and to submit a report based on the results. The results and report will be included in a final report on all the socio-economic assessments carried out in a more comprehensive socio-economic study by SEMP/CORDIO.

The consultant will submit a preliminary report based on the results of the occupational structure survey. The report should include the following:

- Research and analysis methods
- Results at the park level: importance of Fisheries
- Results at the village level
- Results at the sub-village level for the most marine resource dependent
- Identification and distribution of key livelihood activities
- Details of activities in fishing dependent households

**4. Qualifications and experience**

- The individual should have a record in carrying socio-economic research in coastal communities and should have at least a Masters degree in social sciences.
- The individual should be able to demonstrate working links with ongoing socio-economic research programmes in the region and have some knowledge on the management of marine protected areas.

**5. Communication and logistics**

The consultant will liaise with the MBREMP Project Technical Advisor (TA) and MBREMP Project Coordinator (PC/Warden in Charge) as the principle contact people in the MBREMP Project. The TA and PC will refer to the IUCN EARO Marine and Coastal Ecosystems Technical Coordinator on all technical matters and will refer the consultant to the Marine and Coastal Ecosystems Technical Coordinator when needed. Close collaboration with the MBREMP Project throughout all phases of the work is required. The MBREMP Project will provide necessary logistical and equipment support.

**6. Time frame**

The analysis of the occupational structure data will begin in January 2004. The preliminary report based on the occupational structures of communities within MBREMP will be submitted by February 28th 2004.

## Appendix B: Interview guide and Training material

### GUIDE NOTES 1: COLLECTION OF DATA ON OCCUPATIONAL STRUCTURE
**(Mnazi Bay Ruvuma Estuary Marine Park, June 2003)**

**1. Aim**

The aim is to map the activities on which communities located in Mnazi Bay Ruvuma Estuary Marine Park (MBREMP) depend on. The occupational structure will indicate the relative dependence, at the community level, on different activities (sources of food or sources of income).

**2. Use**

The information gathered will contribute to develop management strategies for the Park. Increasing the knowledge on livelihood strategies of communities located inside the park will help the park to understand and work effectively with these communities. It will help the park target the appropriate user groups when investigating ways to reduce pressure on the natural resources in side the Park.

**3. How is the information collected?**

Collecting data on occupational structure is done through key informant interviews. Two or three informants are asked to list all the households in their area and for each household they are asked to provide information on the number of household members, the number of household members contributing to the households' income or food bases and list activities carried out (for food or income).

**4. Process**

**4.1. Identify key informants**
Informants have been identified in partnership with the Village Liaison Committees and Village Government.

- The informants need be from the area researched
- They need to know their neighbourhood well (usually middle aged or elder people)
- There needs to be gender balance: Informants should include men and women.

**4.2. Introduction to key informants**
Before starting the interviews it is important to introduce the research well and reassure the informants about the objectives of the research as they might be suspicious. Thus, the research team members will:

- Introduce themselves.
- Introduce the research: a starting point to working together, understanding the communities better, and help the Park contribute towards livelihood development.
- Introduce what will be expected from the informants: list the households in their neighbourhood and list activities carried out by these households. Insisting on the fact that all activities (food or income) are of importance to the research.
- Make sure that informants and research team have the same understanding/definition of what a household is.

**4.3. Interviewing**
**4.3.1. Information required** from the informants for each household will be:

- The name of the head of household (HH)
- Number of household members,
- Number of the households members contributing to the households income or food base and
- The activities carried out by the household members (more details will be asked on some of the activities is required, see table 1).

#### 4.3.2. Listing households

In order to help the informants not forget households, researchers will work out with the informants a systematic way of listing households. This will be done by following streets, lines or other features that the informants consider appropriate. The households will then be listed systematically following the physical feature chosen.

#### 4.3.3 Questions and prompting.

- ***Open ended questions***

Ask **open ended** questions so that no information is missed and informants are able to provide broad range of information. For example for each household first:
→ **Ask**: what activities household members are doing for living?
→ **NOT** "do people in this household fish?

- ***Prompting***

However, it will be important to prompt the informants to make sure that all activities of the households are mentioned.
Prompting questions include questions such as "what else? Are there other activities? …
If an activity which is very widespread such as farming was not mentioned, it might be worth for the researcher to prompt and ask a close ended question such as "so…no one farms in this household?".

- **Activities and details**

Table 1 lists activities identified by the research team during the training session and the **details required** from the researcher for some of these activities. The list of activities is not final, other activities will be added according to findings.

**Table 1: Activities identified and details required for some of the activities (researchers will want to know particularly about the underlined items).**

| Marine related | Farming related | Business related | Other |
|---|---|---|---|
| **Fish trading**: type (e.g.: dagaa, fresh fish, jongoo, kamba…)<br><br>**Fishing**: number of fishers in the household, fishing method used → (madema, mshipi, bunduki..nyavu: *prompt for kokoro*)…<br><br>**Shell collecting**: food, or selling<br><br>**Sea weed farming** | **Farming**: food, business.<br><br>If farming for business:<br><br>→ which crops are cultivated for business (e.g. *prompt for korosho*) | Business: which business?<br><br>(e.g. selling mandazi, duka, hoteli, pombe selling, *wood selling, chokaa making and selling, mkaa making and selling…*)<br><br>If wood selling is mentioned: → ask whether it is mangrove wood or other wood. | Mganga<br>Employed: where?<br>Retired<br>Transport (by bicycle)…<br>Etc… |

#### 4. Note taking

- **Write information fully**

Notes need to be clearly written so to make work easier for the person who will enter the data. In the first stage of the research, the information will be written in full. Coding, will be developed at a later stage.

- **Note format**

The following format is suggested for note taking

**Table 2: Format in which information will be written down and examples**

Note: Informants': name, activity, age, gender
Date
Village

| Location (Kitongoji) | Name HH* | Number people | Number of "contributors" | Activities |
|---|---|---|---|---|
| Kondo | Said Hussein | 5 | 2 | - Fishing (2, mshipi, kokoro, nyavu inch 2)<br>- Farming (food) |
| | Suleiman (w)** | 2 | 1 | - farming (food and business: korosho, mahindi),<br>- Business (chokaa, selling mangrove wood)… |

*: Head of Household (HH)
**: If the head of household is a woman note (W).

## Appendix C: Data entry Template (for ease of presentation the categories have been copied under each other, instead of staying in one row)

**This is a template but You as a Data entry person you will have to adapt the categories to the research findings!**

**OCCUPATIONAL STRUCTURE- TENTATIVE TEMPLATE**

| Type of entry--> | | Name | Number | Name | Name | Number | NAme | Yes=1 | Number | Number |
|---|---|---|---|---|---|---|---|---|---|---|
| | Date Interview | Name interviewer | Key Informants | Village | Kitongoji | Household Number Village level | Head Household Name | Woman | Household Members | Contributors |
| | | | | | | | | | | |
| Example | 7/21/03 | Innocent | 3 | Mtwara | Kondo | 1 | Hadidja Mwanamkuu | 1 | 4 | 2 |

| Number | Yes=1 No=0----------> | | | | | | |
|---|---|---|---|---|---|---|---|
| ACTIVITIES | | | | | | | |
| | Fishing activities | | | | | | |
| FISHERMEN | Beach seine | Mshipi | Nyavu | Kutanda | Madema | Wando | diving |
| | | | | | | | |

| Yes=1 No=0----------> | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| Seaweed farming | Shells collection | | Fish/marine product trading | | | | | Other fisheries dep | |
| | Food | Business | Fresh Fish | dagaa | Sea cucumber | Octopus | prawns | Canoe builders | Nyavu makers |
| | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| Trading and exploitation of other natural resources | | | | | Natural resource dependent artisans | | | | |
| Mangrove w | Non mangrove wood | Charcoal | lime | | Carvers | Weaving | Trad beds | Trad dr | |
| | | | | | | | | | |

| Farming food | Farming for business | | | | | Livestock | Business (own) non natural resource dependent | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cashews | coconut | fruits | groundnuts | | | Food vendor | duka | Pombe shop | Honey | Transport | |
| | | | | | | | | | | | | |

Yes=1 Not=0---------->

| Artisans non NR | dependent on natural resources | | | | | | | Casual labour | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Builder | Carpenter | Taylor | Msusi | Radio | P0ttery | **Smith** | | General | Mkwezi | | |
| | | | | | | | | 0 | 0 | | |

| **Employed** | **(Private)** | **Employed (Government)** | | | **Other** | | | |
|---|---|---|---|---|---|---|---|---|
| Locally | Outside | **Teacher** | | | Dancers | Retired | musician | **R**eligious leaders. |
| 0 | 0 | 0 | | | 0 | 0 | 0 | 0 |

## Appendix D: Number of households in quarters and proportion of village households they represent

a) Sea Bordering villages

| Quarters | Number of Households | % of village Hsld |
|---|---|---|
| Mvinje | 17 | 8.5 |
| Pwani | 66 | 33.2 |
| Mkujuu | 116 | 58.3 |
| ***Mkubiru*** | ***199*** | ***100*** |
| Shuleni | 61 | 14.1 |
| Barabarani | 101 | 23.3 |
| Mlandege | 96 | 22.1 |
| Mnaida | 126 | 29.0 |
| Hyuvi | 50 | 11.5 |
| ***Mngoji*** | ***434*** | ***100*** |
| Liumba | 127 | 14.0 |
| Ruvula | 146 | 16.0 |
| Sokoni | 205 | 22.5 |
| Majengo | 139 | 15.3 |
| Yao | 162 | 17.8 |
| Mnuyo | 131 | 14.4 |
| ***Msimbati*** | ***910*** | ***100*** |

b) Mangrove villages

| Quarters | Nnumber of Households | % of village Hsld |
|---|---|---|
| Mabatini | 112 | 24.7 |
| Pwani | 98 | 21.6 |
| Shangani | 99 | 21.9 |
| Majengo | 102 | 22.5 |
| Mahiva | 42 | 9.3 |
| ***Madimba*** | ***453*** | ***100*** |
| Chota | 80 | 23.1 |
| Maniyoka | 103 | 29.7 |
| Mitambo | 76 | 21.9 |
| Mitondo | 88 | 25.4 |
| ***Mitambo*** | ***347*** | ***100*** |
| Miembeni | 62 | 19.2 |
| Patakuwa | 63 | 19.5 |
| Majengo | 141 | 43.7 |
| Pwani | 57 | 17.6 |
| ***Litembe*** | ***323*** | ***100*** |
| Gulioni | 250 | 27.1 |
| Mnaida | 274 | 29.8 |
| Magomeni | 96 | 10.4 |
| Pachani | 301 | 32.7 |
| ***Tangazo*** | ***921*** | ***100*** |
| Mwembe | 135 | 24.0 |
| Misufini | 106 | 18.8 |
| Msijibu | 45 | 8.0 |
| Migombani | 143 | 25.4 |
| Mchangani | 134 | 23.8 |
| ***Kilambo*** | ***563*** | ***100*** |

## Appendix E: Occupational structure per village in percentage of households involved

| Village | Marine Res. | River | Other Res. | Farming | Other Bus. | Artisan | Casual | Employed | Other |
|---|---|---|---|---|---|---|---|---|---|
| Kihimika | 0 | 9.2 | 45.6 | 97.0 | 43.7 | 12.1 | 22.4 | 3.3 | 0.7 |
| Kilambo | 18.8 | 0 | 43.0 | 98.9 | 19.5 | 3.6 | 9.4 | 4.6 | 1.2 |
| Kitunguli | 0 | 15.7 | 8.0 | 96.8 | 9.3 | 1.9 | 2.9 | 5.4 | 0.0 |
| Litembe | 30.7 | 0 | 23.2 | 95.4 | 17.0 | 4.0 | 25.4 | 4.6 | 0.3 |
| Madimba | 26.0 | 0 | 38.9 | 92.5 | 14.6 | 7.3 | 3.5 | 6.0 | 0.9 |
| Mahurunga | 0.0 | 19.8 | 23.0 | 99.1 | 12.6 | 5.0 | 16.2 | 0.9 | 0.0 |
| Mitambo | 24.8 | 0 | 25.9 | 98.8 | 25.6 | 8.9 | 9.8 | 0.6 | 1.4 |
| Mkubiru | 62.8 | 0 | 13.1 | 68.8 | 20.1 | 3.0 | 7.5 | 3.0 | 1.5 |
| Mngoji | 61.8 | 0 | 23.0 | 89.9 | 15.4 | 6.0 | 8.5 | 3.7 | 0.5 |
| Msimbati | 74.4 | 0 | 7.6 | 60.8 | 19.2 | 8.8 | 3.3 | 2.9 | 0.2 |
| Tangazo | 27.9 | 0 | 6.2 | 86.3 | 12.4 | 12.6 | 0.9 | 1.5 | 0.2 |

## Appendix F: Percentage of households involved in marine Activities per villages

| Village | Fishing | Fish trade | Shell coll. | Seaweed |
|---|---|---|---|---|
| Kilambo | 16.9 | 3.4 | 0.0 | 0.0 |
| Litembe | 25.1 | 9.3 | 4.0 | 0.0 |
| Madimba | 10.8 | 3.5 | 15.9 | 0.0 |
| Mitambo | 20.7 | 4.3 | 1.2 | 0.0 |
| Mkubiru | 55.8 | 10.6 | 8.0 | 1.0 |
| Mngoji | 53.7 | 12.0 | 22.1 | 0.0 |
| Msimbati | 53.1 | 44.8 | 10.9 | 0.0 |
| Tangazo | 20.5 | 8.8 | 0.2 | 0.0 |

## Appendix G: Cash crops (in percentage of farming households growing them)

| Village | Cashews | Rice | Groundnut | Fruit | Coconut | Pigeon Peas | Cass./Sesame |
|---|---|---|---|---|---|---|---|
| Kihimika | 77.6 | 52.2 | 0.5 | 2.0 | 1.0 | 0.0 | 3.9 |
| Kilambo | 94.0 | 86.6 | 24.6 | 30.9 | 1.2 | 23.2 | 0.4 |
| Kitunguli | 22.8 | 97.0 | 1.7 | 11.7 | 0.0 | 0.0 | 0.0 |
| Litembe | 88.7 | 52.4 | 6.9 | 12.1 | 6.5 | 8.5 | 0.0 |
| Madimba | 74.5 | 9.1 | 23.2 | 7.2 | 20.9 | 1.1 | 1.1 |
| Mahurunga | 37.6 | 79.4 | 0.0 | 9.7 | 0.0 | 0.0 | 0.0 |
| Mitambo | 53.0 | 11.6 | 39.2 | 6.9 | 28.4 | 37.5 | 0.0 |
| Mkubiru | 78.9 | 29.6 | 9.9 | 0.0 | 22.5 | 4.2 | 0.0 |
| Mngoji | 86.8 | 0.0 | 24.1 | 0.4 | 11.7 | 2.6 | 0.0 |
| Msimbati | 95.3 | 0.9 | 3.8 | 2.6 | 8.2 | 2.3 | 0 |
| Tangazo | 71.4 | 38.6 | 2.0 | 0.6 | 0.6 | 0.2 | 0.0 |

**Appendix H: Dependence on marine resources for marine dependent households per village (out of marine dependent households, % who depend solely on fishing or solely on marine resource associated activities (fishing and trading or shell collecting, or only trading etc)…**

| Village | Fishing only | Marine resources only (fishing and trading, shell collecting etc) | Marine resource activity and subsistence farming only | Marine resource activity and other natural resource based activity only | Marine resource activity and other activities |
|---|---|---|---|---|---|
| Kilambo | 0.9 | 0.0 | 0.0 | 0.9 | 98.2 |
| Litembe | 0.0 | 1.0 | 13.0 | 3.0 | 83.0 |
| Madimba | 0.0 | 0.8 | 11.0 | 2.5 | 85.6 |
| Mitambo | 1.2 | 1.2 | 15.1 | 0.0 | 82.6 |
| Mkubiru | 9.6 | 4.0 | 23.2 | 3.2 | 60.0 |
| Mngoji | 5.2 | 2.2 | 13.7 | 1.1 | 77.8 |
| Msimbati | 3.8 | 16.7 | 12.2 | 2.4 | 64.9 |
| Tangazo | 3.1 | 1.2 | 24.0 | 0.0 | 71.7 |