A SOCIO-ECONOMIC BASELINE ASSESSMENT OF THE MNAZI BAY - RUVUMA ESTUARY MARINE PARK

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By

D. Malleret

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Cover photo: D. Malleret (Ruvula beach).

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EXECUTIVE SUMMARY

Introduction

A socio-economic assessment of the Mnazi Bay - Ruvuma Estuary Marine Park (MBREMP) was carried out from March to July 2004 with the objective of increasing understanding on communities (approximately 28 000 people) who live within the Park. Understanding better these communities, the way in which they use and how much they depend on MBREMP marine resources will increase the chances of involving these communities effectively in MBREMP management, as stipulated in the *Marine Parks and Reserves Act* (1994), and thus increase chances of achieving sustainable resource use.

In the first stage of this assessment, the economic structure (occupational structure) of MBREMP communities was mapped. This gave a first indication of the dependence on marine resources at the community and MBREMP levels. It also showed the variety of activities on which livelihood strategies are based. The second step of the assessment was a household survey in five selected villages to investigate further the dependence on marine resources at the household level and households' relative wealth status. At the same time marine resource related use patterns and user based conflicts were studied through focus groups and key informant interviews.

Occupations

The occupational structure showed that a wide variety of activities are carried out in the Park (55 activities were identified) and that 35% of the MBREMP households are involved in marine resources associated activities (they depend at least partly on marine resources for their livelihood) through fishing and trading (fish, crustaceans, holothurians, cephalopods and shells) and in a very small proportion through sea weed farming. It showed that MBREMP communities could be differentiated according to four main geographic areas: seafront communities whose involvement in marine resource exploitation and trading is much higher than in other communities (50-60% of households involved), mangrove villages, riverine villages, and 'other' villages.

The most dependent villages on marine resources (highest number of fishers, and/or highest proportion of households involved in marine resource associated activities) are sea front villages and Tangazo (a mangrove village). Most marine resource dependent households also depend on other activities for their livelihood. Very few rely only on marine resources. This was confirmed by the household survey.

The household survey provided further details on the level of dependence on marine resources at the household level. The time commitment to fishing was found to be high; most fishers spend 5 to 6 days fishing per week, days-off being taken for religious practices and gear or boat maintenance. A few days are taken off per month at the beginning of neap tides which is not considered a productive period. Most fishing households in seafront and mangrove villages fish at least three quarters of the year. Months taken off are for farming or due to weather conditions (strong winds). Most fishing households did not consider fishing to provide a sufficient source of income to sustain them, despite ranking fishing as their main source of income.

Stakeholders, resource use patterns and user group conflicts

Stakeholders of the marine resources in the Park are numerous and varied, they include fishers (men and women), traders (men and women), agents, exporters, local government, consumers, the Marine Park authority and so on. These stakeholders are based in or outside the Park (e.g. inland Tanzania, Dar es Salaam, Europe, Asia etc.). The resource use patterns investigation focused on the primary stakeholders: resident fishers (approximately 1400) and resident traders (approximately 160).

Fishing methods used in MBREMP include nets, spears, lines, trap, and diving. Fishing is carried out day and night, mostly near shore with small non motorised boats. Handlines and nets, particularly '*tandilo'* (women), are the most widely used gear. Men dominate the activity except for '*tandilo*' fishing. Shell fishing is very common and involves a high number of fishers. This activity is divided between men who go diving, particularly ornamental shells, and women who glean for shells mainly for food. Shell fishing was found to be opportunistic and occasional.

Tidal and seasonal patterns affect fishing in the Park. Most fishing starts at low tide and ends at high tide. Spring tides are considered the most productive times of the month for fishing. Spring tides are the peak octopus and shell fishing times. Three main seasons were identified by fishers: the Southeast monsoon (March-October), the Northeast monsoon (November-February), and the '*matalai*' (between the seasons). Most fishers consider the Northeast monsoon and '*matalai*' as the best fishing seasons (best sea conditions and higher catch) except sea cucumber fishers for whom the Southeast monsoon is best.

Fishers who operate in MBREMP are mostly residents of the Park; however crews from Mtwara, Msangamkuu, Ngao, and Mikindani also fish in the Park. Similarly, Park fishers also fish in Mozambique. Results suggest that the most used fishing grounds for MBREMP fishers are those located around Bahasha, Litokoto, and Namponda.

Findings from this study suggest that MBREMP's marine resources are under pressure. Most resources are perceived as having declined in the last 10 years (catch has reduced and the number of fishers has increased). This is particularly the case for ornamental shells, sea cucumbers, and demersal fish. However, large mesh size net fishers and some '*tandilo*' fishers perceived their catch as having increased. Two reasons for this were identified by the groups interviewed: the effective end of dynamite fishing in 2000, and the ban on beach seining by the Marine Park. Despite the drop in catches, income is not considered as having dropped dramatically in recent years due to price increases.

Fishing skills and cost of gear often determine which fishing gears fishers will use. Fishers expressed a preference for net fishing, the most expensive fishing method, because it is considered as providing the best income and catch. Fishers can also join net fishing crews at no capital cost. Fishing gear and boats are often shared among a group of fishers, or belong to rich individuals '*tajiri*' who employ fishers.

Results also showed that trading is an important economic activity in MBREMP communities, particularly in Msimbati where more than a third of marine product traders are located. Fresh fish are mostly traded at the local level (Park villages and Mtwara), dried fish is mainly sold inland, and sea cucumbers, octopus and shells are mostly exported. Sea cucumbers, shells, opercula, and octopus are sold by traders to agents in Mtwara who operate for exporters based in Dar es Salaam and Zanzibar. These exporters provide agents with cash, and sometimes with boats and ice boxes, to purchase the products. Some exporters operate directly from Mtwara (e.g. for octopus) or base themselves temporarily in the Marine Park (e.g. sea cucumber exporters).

Traders' peak seasons relate to product availability, demand (customers' purchasing power which increases during cash crop harvests) and rainfall patterns (dried products are of better quality during the dry season). These three factors are interlinked. The amount of product traded increases during these peaks, as does the number of operating traders. The margins taken by traders vary according to the products sold, from 30% (sea cucumber) to 100 % (fresh fish). Traders and agents interviewed all have noticed a decline in ornamental shells and sea cucumbers availability. At the same time the dried fish, seashell opercula (protective cover of seashells), and octopus trades are booming. It was estimated that 300 mt of octopus is exported from Mtwara per year (30 mt from the MBREMP), 1.5 mt of sea cucumber and 30 mt of opercula.

Despite the lack of information on income, it appears that sea cucumber and dried fish traders are generally the wealthiest marine resource dependent groups.

Investigating fishing and trading use patterns showed that Mozambique plays an important part as a fishing ground and marine product provider to MBREMP communities. According to agents, most ornamental shells and sea cucumbers come from Mozambique.

A lack of organisation among the fishers and traders was detected. No fisheries related association or cooperative were mentioned as being active in the MBREMP.

Although no major conflicts were identified among stakeholders (setting aside the relationship between Nalingu community and the MBREMP that excluded them from this study), some important conflicts exist. A number of groups (including fishers and traders) interviewed expressed resentment towards the MBREMP. Disagreement between traders and fishers based on the lack of respect for informal financial agreements is another important source of conflict. Another important conflict was found between local and outside traders relating to the higher purchasing power of outside traders. This may affect the price and quantity of fish available at the local level (access to affordable protein for local people) and on a seasonal basis.

Socio-economic status
Figures on income and catch were difficult to obtain, however it appeared from the groups that were interviewed that traders were better off than fishers, particularly sea cucumber traders and dried fish traders. Sea cucumber fishers also consider themselves well off. This was confirmed by the household survey.

A simple indicator was used to measure the relative wealth of different user groups. The indicator was based on material style of life data (household assets) and took into consideration local based wealth/poverty criteria. These included house construction material and condition, livestock, land ownership, transport ownership, and households' access to power.

The impact of demographic, economic and geographic factors on households' socio-economic status, were tested. Although no significant differences were found according to general categories of activities, significant differences were detected within activity groups. Indeed results show that households mainly dependent on fishing (fishing ranked as the most important source of income) are the poorest of the 'marine dependent households'. Traders and particularly sea cucumber traders are the wealthiest in the group.

Widow headed households were found to be more vulnerable than other households. Fishing households' relative wealth status was not found to vary significantly according to the fishing patterns (e.g. gear, access to boats etc.), however, results showed that boat ownership and the type of boat owned reflects the wealth of fishing households.

Finally, one of the most significant findings of this part of the research was that wealth, as measured by material style of life data, is positively linked to the diversity of the households' portfolio of livelihood activities. The most vulnerable households were found to be households dependent solely on one activity for their livelihood, and the **most vulnerable** of all are those who **depend solely on marine resources for their livelihood**.

Issues raised and recommendations for monitoring
Based on the socio-economic baseline assessment, a number of issues were highlighted and a monitoring programme was recommended.

- The main threats to MBREMP marine resources come from: a) the number of people involved in marine resource extraction; b) the dependence of the communities in general on marine resources for their livelihoods and a high number of households in particular; c) poverty/lack of access to funds/capital; d) the demand for marine products and the volume of trade of specific marine products; and e) destructive fishing methods.

- The dependence on marine resources varies from village to village (the most dependent on marine resources are Mkubiru, Mngoji, Msimbati and Tangazo, and probably Nalingu). The heterogeneity of village level dependence will have to be taken into consideration in the zoning process to ensure that the most vulnerable households are not deprived of their main source of livelihoods. Alternative livelihood opportunities could help to mitigate negative impacts of zoning if readily available.

- Shells are heavily exploited. It is recommended that the sustainability of the current level of shell exploitation and the contribution of shell meat to the households' animal protein supply be

investigated further. This would provide the Park with a basis on which to take decisions on how to regulate shell collection/fishing.

- Destructive methods, particularly small mesh size nets are of concern. One of the most difficult issues for the Marine Park will be to deal with '*tandilo*' fishing. This is a small/zero mesh size fishing method (mosquito net or cloth) used by women. Contrarily to beach seines, '*tandilo*' is not perceived as a destructive gear by the communities. Its use is very widely spread and may be one of the only direct sources of income for women in the Park. Further information on the cultural, social, religious, and economic factors that affect women's economic opportunities in the MBREMP will be necessary for the Park to work with these women to identify appropriate alternative sources of livelihood.

- The lack of fisher and trader organisations, and the difficulty to access funds/capital, constrains people's economic opportunities. This lack of economic opportunities is likely to increase pressure on currently exploited marine resources. Investigating possibilities of creating an enabling environment for marine resource user groups to organise themselves to access funds/capital may be a way to reduce pressure on MBREMP marine resources. Micro credit schemes for the marine resource user groups would be worth exploring.

- MBREMP's communities' dependence on apparently declining Mozambican marine resources is a pressing issue to tackle for the Park to achieve its goals.

- Good Park/community relations are essential if the Marine Park is to achieve its objectives and be managed in a sustainable way. It was found that miscommunication and misinformation are often at the root of negative attitudes from the communities towards the MBREMP. It would be worth strengthening MBREMP's community awareness activities.

- This study shows that the health status of Marine Park resources is subject to a complex web of international/global, national, regional, and local influences that are determined by aspects such as basic food needs, taste, aesthetics, culture, and religious practices. The Marine Park does not have the power to influence all these aspects, however, by working in close partnership with as wide a spectrum of stakeholders as possible who impact MBREMP resources and will be impacted by Marine Park regulations, the Park may contribute to changing consumer preferences (e.g. in relation to threatened species).

- In order for Park Management to be aware of changes in the socio-economic context of the MBREMP, and the impacts of Park Management actions on community behaviour and economic opportunities, it is recommended the following be monitored:
    1. Community occupational structure (in the most marine dependent villages),
    2. Resource use patterns (in the most marine dependent villages),
    3. The trade of seashells, sea cucumbers and octopus (in all relevant villages)
    4. Marine product prices (in all relevant villages),
    5. Relative socio-economic status of marine resource users (in selected villages).

  It is also recommended that a comprehensive socio-economic assessment be carried out periodically (e.g. every 10 years).

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1 Introduction

Coastal communities are often highly dependent on marine resources for their livelihood and food security (Malleret King, 2000, Malleret King *et al*., 2003). By introducing changes to traditional user rights, and to the socio-cultural context within which coastal communities determine access to marine resources (Fiske, 1992; Cocklin *et al*., 1998), Marine Protected Areas (MPA), such as the Mnazi Bay - Ruvuma Estuary Marine Park (MBREMP), are likely to affect these communities

Past experiences show that without the support of the communities affected by the establishment of an MPA, the MPA has very little chances of success (Salm and Ngoile, 1998). Increasingly, coastal communities' effective involvement is seen as paramount to the success and sustainability of MPA management (Christie and White, 1997, Cocklin *et al*., 1998). However, effective community involvement is not always achieved. Two main reasons for this have emerged, the difficulty in finding a good balance between community empowerment and government role, and the failure to acknowledge communities' heterogeneity (Leach *et al*., 1997; Cocklin *et al*., 1998). Indeed, communities are a complex make up of user, gender, ethnic, religious and wealth groups, whose interests and objectives are often in conflict (Leach *et al*., 1997). When these differences are not acknowledged by MPA managers, key stakeholder groups may not be involved in the MPA establishment and management process, thus leading the MPA to fail.

For MPAs to have a chance to succeed in their marine resource management and conservation objectives, it is thus essential that managers understand the diversity of stakeholders, of livelihood strategies, the way they use the resources and the way in which they determine access to the resources. This is why a socio-economic baseline assessment of the Mnazi Bay - Ruvuma Estuary Marine Park communities was carried out. The objective of this assessment is to increase the Marine Park's understanding of the communities within it and provide the foundation for taking account of their diversity in the Marine Park's management plan.

1.1 Background to the socio-economic assessment

The Mnazi Bay - Ruvuma Estuary Marine Park (MREMBP) was gazetted in 2000 following a consultative process that had started in 1998. It covers an area of 650 km^2, 450 km^2 of which are land. The remaining 200 km^2 are marine, including mangrove forests, islands, seagrass, and coral reef ecosystems. The rationale behind incorporating such a wide area of land into the Marine Park was to constitute a buffer zone and control human activities that impact the protected marine environment (UNDP/GEF, 2000).

The inclusion of the land and communities adjacent to the marine area was also to ensure that local marine resource users are included into the management and planning processes as required by *Marine Parks and Reserves Act* (1994). This meant, however, that 11 villages, 3 sub-villages with a population of approximately 28,000 people (Census 1988) were incorporated into the Marine Park. Furthermore, population densities around the Marine Park are high (UNDP/GEF, 2000).

The MBREMP is located in Mtwara Region, at the Southern tip of Tanzania's coast. It is rich in biodiversity and has outstanding beaches and seascapes, coral diversity, an important population of turtles and marine mammals such as whales migrating through the area on a seasonal basis. This was the basis of its establishment. Its tourism potential as well as its location within the realm of international economic development initiatives (e.g. Mtwara Development Corridor Project) makes the Marine Park an important player in developing opportunities by the attraction it represents for external investors. However, recent biodiversity assessments and previous research in the area have shown that the marine environment is highly impacted by human activities, particularly by over fishing, destructive fishing, and coral mining (Guard *et a*l. 1998; UNDP/GEF, 2000; Guard, 2002; Obura *et al*., 2004;

Richmond, 2004). Mangrove forests were also found to bear the mark of intensive use (Wagner *et a*l., 2004).

A UNDP/GEF project was initiated in 2002 in order to assist 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 the marine biodiversity and resources of the MBREMP*". Thus, one of the main tasks of the project is to reduce pressure on the marine environment in order to achieve sustainable use of marine resources and conserve the Marine Park's marine biodiversity (UNDP/GEF, 2000).

The biodiversity assessments carried out in the Marine Park were to establish baseline knowledge on biodiversity and health status of mangroves forests, corals reefs, intertidal and seagrass areas. At the same time, it was necessary to establish baseline knowledge on the social and economic context of the Marine Park because the main task of the project concerned resource use and because '*managing natural resources is about managing resource users'*. A baseline socio-economic assessment was thus also required.

The combination of biodiversity and socio-economic assessments will contribute to inform the development of a Marine Park General Management Plan (GMP), particularly the zoning process. These assessments also provide a basis on which the Marine Park will be able to monitor its progress in achieving its goals and help steer its actions. The results will be entered into the GIS database that has been developed to help manage the Marine Park.

The socio-economic assessment is the first step towards understanding the communities that operate in the Marine Park, their activities, their relation with marine resources, their vulnerabilities, and their concerns about resources and their management. This understanding is essential for the Marine Park to be able to work with the communities whose participation will be key to its success and sustainability.

This report presents the finding of the socio-economic assessment carried out from April to July 2004.

After the introducing the objectives of the assessment, methods and research team in section 1, a brief literature review is done in section 2. Section 3 presents the occupational structure of the Marine Park, and aspects relating to the dependence of households involved in fisheries associated activities.

Section 4 investigates further fisheries related resource use patterns (i.e. methods used, timing, location of activities, characteristics of the users) as well as changes, conflicts and challenges related to marine resource uses.

Findings on the relative socio-economic status (as measured by households assets) of Marine Park households are presented in Section 5. In sections 6 and 7 the report is concluded and recommendations on a monitoring programme are made.

1.2 Aims and objectives of the socio economic assessment

The aim of the socio-economic assessment is to provide the UNDP/GEF Development of MBREMP project with baseline information on the existing livelihood systems of Marine Park communities, their dependence on marine resources, the relationships amongst user groups, the way in which marine resource dependent people use the marine resources and their relative wealth status. The socio-economic assessment also includes a review of relevant literature.

As stated in the terms of reference (Appendix 1), the socio-economic assessment integrated the following aspects:

1. A review of the relevant socio-economic information
2. An occupational structure study for which data was collected in August 2003 and analysed in March 2004 (see Malleret and Simbua, 2004)

3. A resource use patterns and conflicts study (data collected in April 2004)
4. Household socio-economic status investigation (data collected in June 2004)
5. Capacity building

The three research components (occupational structure, resource use patterns and conflict, socio-economic status) overlapped. This enabled the author to cross check and build on the findings of each component. The objectives of the above components are described below.

1.2.1 The literature review

The objective of investigating previous socio-economic information on the MBREMP area was to be able to understand the area better, build on existing information, and compare results and identify changes.

1.2.2 The occupational structure

The first step in carrying out the socio-economic assessment was to investigate the occupational structure of Marine Park communities, that is, what Marine Park people do for a living, be it for income or subsistence (Berkes *et al*., 2001). The results of the occupational structure survey (Malleret and Simbua, 2004) contributed to identifying aspects that needed further investigation, some of which are explored in this report. 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 or income generating options by the project are successful or not.

The objective of understanding the occupational structure of the Marine Park was to provide a "map" of the activities which constitute the Marine Park communities' complex livelihood systems, and establish what their dependence on marine resources is, as well as identifying zones of potential high impact (threats) on marine resources. Other livelihood activities considered important were also identified and investigated further (details can be found in Malleret and Simbua, 2004).

At the same time, the occupational structure established a comprehensive sampling frame of households that was used in the two other research components of this assessment.

Detailed results of the occupational structure are available in Malleret and Simbua (2004). This report focuses on presenting results of the occupational structure survey related to fisheries associated livelihoods in particular.

1.2.3 Resource use patterns

The second step of the assessment was to research the marine resource use patterns (Bunce *et al.*, 2000) and user group relations (concentrating on conflicts) with the Marine Park. This was to provide the Marine Park with baseline information on:

- who exploits the resources and whether they are from the Marine Park or not
- how these resources are exploited (equipment),
- when are the peak seasons,
- what species are mainly exploited,
- where activities are concentrated.

This information will help the Marine Park identify where the pressures come from (who impacts the marine resources), directly and indirectly, and whose participation will be required to establish the management plan. It will also contribute to identify areas where and periods when pressure on the marine resources is likely to be highest.

Stakeholder perceptions of changes in the status of resources were also investigated in order to show the current and perceived trends related to resources.

The objective of investigating conflicts was to understand how marine users groups relate to each other. Conflicts can reflect increasing pressure on resources (higher competition for the resources), but also how local stakeholders perceive management authorities. If the marine users have a negative perception of the Marine Park management authorities, working with these communities and establishing sustainable management systems will be more difficult. Thus, conflicts and the reasons behind these will provide information on:

- potential areas where a number of incompatible activities are carried out, and where user based conflicts are likely to occur. Understanding these will be essential for effective planning and management.
- how stakeholders perceive the Marine Park and thus allow suggestions to be made for the Marine Park improve relations with communities.

1.2.4 Socio-economic status/ Well being

The objective of investigating the relative socio-economic status of Marine Park communities, particularly of households involved in marine and fisheries activities was to provide the Marine Park with a more comprehensive understanding of the communities within its boundaries as well as potentially identifying the most vulnerable user groups. This information will contribute to increase the Marine Park's capacity to evaluate the implications of some of its activities on target groups, and help identify groups who may need special attention. Relative wealth may affect groups' attitudes towards changes in marine resource management systems and their capacity to cope with such changes (Maxwell and Frankenberger, 1992).

1.2.5 Training requirements

Increasing the understanding of the Marine Park team on why socio-economic work is needed when establishing and managing a Marine Park, and increasing their capacity to carry out socio-economic work was sought throughout the socio-economic assessment process. Members of the MBREMP team were involved in the study from the beginning. Training was provided on data collection and entry, which was partly done by the MBREMP community conservation team (see table 3). Field guides and notes were produced and are available at the MBREMP office (Appendices 2 and 3).

Local community members were also hired and trained to assist with data collection (i.e. household surveys). Skilled facilitators were hired from Mtwara to collect data on resource use patterns (see table 3).

1.3 Sites

The Marine Park is located in Southern Tanzania; its southern end is contiguous to the Mozambique border (see Map 1). Eleven villages and three sub-villages are within the Marine Park. Four of these are located around the significantly large bay of Mnazi Bay: Mkubiru, Nalingu, Mngoji, and Msimbati. Mkubiru is not a village *per se*, but a sub village of Mnawene, the main area of which is not included in the Marine Park. Despite being a sub-village, it will be referred to as a village in this report due to its size and for ease of presentation.

Five villages are closely located to the Ruvuma river estuary and border the mangrove area (Madimba, Mitambo, Litembe, Tangazo, Kilambo) and two villages are further inland along the Ruvuma River (Mahurunga and Kitunguli). Kihimika is the village furthest from the marine and riverine ecosystems (see Map 1).

Despite the fact that Nalingu (including the sub-villages of Mnazi and Mnette) is suspected to be the largest marine resource dependent community, no information could be collected on this village because villagers refuse to participate in Marine Park activities and have violently threatened the Marine Park team despite attempts to improve relations. The lack of information on Nalingu is the main limitation of this study.

1.4 Methods

Participatory techniques (focus group discussions, key informant interviews, informal interviews) and a more conventional household survey were used to provide both qualitative and quantitative data. Synergies were sought with other assessments (e.g. fisheries, coral reefs, mangroves etc.) done in the Marine Park.

1.4.1 Literature review

The literature review aimed at identifying existing information on:

- Marine Park communities
- The general socio-economic context of MBREMP

Conventional literature searches were carried out at the Ministry of Tourism and Natural resources, the National Environment Management Council (NEMC) and the offices of the Marine Parks and Reserves Unit (MPRU) in Dar es Salaam. Mtwara based non-governmental organisations (NGOs), particularly the Regional Integrated Programme Support (RIPS) and Concern, were consulted to identify potential relevant sources of grey literature and other unpublished information.

1.4.2 Key informant interviews

Key informant interviews (Bernard, 1995; Bunce *et a*l., 2000) provided the main source of information for the occupational structure.

Informants (men and women) with a good knowledge of their community were selected with the help of the Marine Park Village Liaison Committees[1]. Two to four informants were consulted per village or per quarter (sub-village) for the largest villages (up to 900 households). The term 'quarter' or *'kitongoji'* refer to sub-areas within the villages that may, or may not, be official divisions, but are well known to the villagers.

The first step in the interview process was to agree on a definition of "household". The definition agreed upon with the informants was: people living together sharing food and money. This definition is 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 key informants were asked to go mentally through the households in their area (following a pattern) (Bunce *et al*., 2000; Malleret-King *et al*., 2003) 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 or women. Informants were prompted, based on an interview guide (Appendix 2),

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

so that details and activities were not missed out. Details on particular activities (e.g. businesses, trading, cash crops, wood related businesses and of course marine related businesses etc.) were also asked for.

For larger villages, several interview sessions were necessary to avoid informant fatigue and poor quality data (Slocum *et al*., 1995) which long sessions (over 2 hours) often result in.

Key informant interviews with traders and marine product dealers were also used for the resource use pattern research.

1.4.3 Focus groups and mapping

Focus group discussions (Slocum *et al*., 1995; Bunce *et al*., 2000) were the main source of information for the resource use patterns study. Key informant interviews and informal interviews were also used to cross check specific information. Focus group discussions were carried out in all the marine associated villages (Mkubiru, Mngoji, Msimbati, Madimba, Mitambo, Litembe, Tangazo, and Kilambo) except Nalingu.

Groups were composed of 3 to 10 participants (of mixed ages and gender when relevant). Groups were user based (fishers grouped according to gear, shell fishers, traders according to product traded, and seaweed farmers).

Themes discussed included:

- Who carries out the activity?
- How many people are involved?
- Where is the activity carried out?
- When?
- How is the activity carried out (i.e. techniques, equipment …)?
- What resources are used/targeted?
- How much is exploited/traded?
- Preferred gear
- Conflicts between marine user groups.

Because seasonal fluctuations highly affect the East African Coast and its marine activities (McClanahan, 1988; King, 2000; Malleret King *et al*., 2003; Shao *et al*. 2003) the seasonal aspects of the themes investigated were given emphasis.

A team of six researchers facilitated the group discussions. These researchers were selected because they had facilitation skills but they were given additional training. The discussions were based on interview guides developed by the Team Leader (see Appendix 5).

In addition to the verbal interview process, fisher groups were also asked to draw maps on the ground or on a flip chart of where their main fishing grounds were located. These maps were then transferred onto paper by the facilitators (see examples Appendix 6).

A total of 46 focus group discussions and 343 participants were interviewed through this process.

1.4.4 Household survey

A questionnaire was used to investigate the socio-economic status of Marine Park households and factors affecting this status.

The questionnaire was composed of four parts (see Appendix 7).The first part concentrated on household characteristics, the second part on activities carried out by household members and their relative importance. The third part focused on the well-being of the households based on Material Style of Life data (Pollnac and Crawford, 2000; Berkes *et al.*, 2001). Further details on the indicators used to measure the relative socio-economic status of households are provided in section 5.

The fourth part of the questionnaire targeted fishing households. More detailed information was sought on the fishing activities and assets, including an estimation of income derived from fishing.

As well as providing information on households' relative socio-economic status, the questionnaire provided complementary information to the occupational structure and resource use patterns surveys.

Households were surveyed in five villages (Mngoji, Msimbati, Tangazo, Litembe, and Mahurunga). These were selected based on their importance in marine resource use (findings from the occupational structure), and their representation of locations in the Marine Park (the three areas identifies as seafront, mangrove and inland/river).

Questionnaires were administered in Swahili. A team of interviewers was trained in each of the villages surveyed. The questionnaire took no more than 15 to 20 minutes to be administered and a total of 643 households were interviewed (see Table 1).

1.4.5 Sampling strategy

The "household" was chosen as the unit of study. Indeed, the household is considered as being the unit at which resources are pooled and decisions taken about consumption, production and investment (Corbett, 1988).

Non-random as well as random sampling methods were used. For the Occupational structure, purposive sampling was chosen (Bernard, 1995). Informants (men and women who knew the community well) were suggested by the Village Liaison Committee according to research needs.

The occupational structure provided a comprehensive list of households (head of household name) which was then used as a sampling frame for the focus groups and the household survey. Participants to the focus groups were selected randomly according to their activity. Simple random sampling was used to select the households to be surveyed.

Between 20 and 40% of the households were surveyed in the five villages as shown in the Table 1.

Table 1: Villages and number of household surveyed.

Villages	**No. of households**	**% of the Marine Park households** (excluding Nalingu)	**Surveyed households**	**% village households surveyed**	**Location**
Mngoji	434	8.8	89.0	20.5	Sea Front
Msimbati	911	18.4	187.0	20.5	Sea Front
Litembe	323	6.5	92.0	28.5	Mangrove
Tangazo	921	18.6	185.0	20.1	Mangrove
Mahurunga	222	4.5	90.0	40	River
Total	***2811***	***56.8***	***643***		

The villages selected represented more than half of the population of the Marine Park when Nalingu is excluded.

1.4.6 Analysis

1.4.6.1 Quantitative data

Basic statistics were used to analyse the occupational structure data, and dependence on marine resources. Most of the analysis was done at the community level. For communities involved in marine resource associated activities, data was also at sub-community levels.

Analysis of Variances, simple t-tests and Pearson correlations were carried out using with Systat (10.2) and Excel (Microsoft) software packages, to analyse the household survey data and identify factors influencing households' socio-economic status.

In addition, GIS technology was used to show how the occupational structure, farming systems, and more specifically the level of dependence on fisheries resources by fisheries dependent households varied within the spatial context of the Marine Park. Maps produced combining GIS technology and Power Point (Microsoft) software were produced to identify core threat areas in the Marine Park (number and proportion of marine resource users, main fishing grounds) as well as marine products movements from and to the Marine Park.

1.4.6.2 Qualitative data

Results of the qualitative data collected are presented in tables.

1.4.7 Summary of methods

Table 2 summarises methods, sampling strategies and sites investigated in the socio-economic assessment.

Table 2: Methods and sites

Item	Methods	Sampling	Analysis	Villages
Review	Secondary information			
Occupational Structure	Key informant	Purposive	Quantitative, qualitative	All
Use patterns Conflicts	Focus groups, mapping, Key informant interviews	Random, purposive	Qualitative (tables), part quantitative	Mkubiru, Mngoji Mkubiru, Madimba Mitambo, Litembe, Tangazo, Kilambo
Socio-economic status	Household survey	Random	Quantitative	Mngoji, Msimbati Litembe,Tangazo, Mahurunga

1.5 The Research Team

The research team and their roles are presented in table 3. Twenty-three researchers participated in the socio-economic assessment.

Table 3: The Research Team

Name	Organisation	Role
D. Malleret	CORDIO EA	**Team leader**: concept, methodology, coordination, interview design, data entry, analysis and report writing, training
R. Mwaipopo	University of Dar Es Salaam	**Assistant**: Literature review, resource use pattern data analysis, questionnaire design
J. Simbua S. Mkama	Mnazi Bay - Ruvuma Estuary Marine Park	**Local coordinators**: Coordination in the field, occupational structure data collection, data entry
Mr. Salomon	Regional Government (Education)	**Research assistant**: Data collection, data entry (occupational structure)
N. Milali, R. Eliakim, S. Nahatula, B. Msalya, N. Kaijage, J. Mlaponi.	District Government (Education, Lands), NGOs (Concern)	**Facilitators**: facilitate use pattern focus groups and collect data.
H. Y. Mwarabu, I. Ngute, H. Matavala, A.I. Matola, J.S. Mwale, L. Bernado, R. Hamisi, M. Matola, M. Hassan, A. Yusuf, Z. Mmalambo, S. Mkande, S. Ali, M.S. Lnambe.	Community members	**Interviewers**: household survey

2 Background socio-economic information

Although a rapid socio-economic assessment was done when the MBREMP development project (UNDP/GEF, 2000) was designed, the full report was not available at the time of this study. Furthermore, although non governmental organisations (NGOs) and programmes such as the Regional Integrated Programme Support (RIPS), Concern, Voluntary Service Overseas (VSO), Medecins Sans Frontieres (MSF), Peacecorps and Japan International Cooperation Agency (JICA) have been operating in Southern Tanzania and Mtwara Region for a number of years, socio-economic information is patchy on the Marine Park area.

2.1 Location, population, wealth and services

The Marine Park is located in the Mtwara Region, Mtwara Rural District at the southern tip of Tanzania.

Mtwara Region is one of Tanzania's poorest regions with 38% of its population living below the basic needs poverty line, which is a higher percentage than the national average but lower than Mtwara Region's neighbour, Lindi's is (Household Budget Survey, 2001). Within the Mtwara region, the coastal population was found to be poorer than average (URT, 1997).

According to the population census of 2002, the population of Mtwara region was 1,123,523 inhabitants divided into 5 Districts (MSEP, 2003). Approximately 18% of the Region's population (204 157) were located in Mtwara Rural District (URT, 2004) with an average household size of four people. Based on the 1998 census, the MBREMP communities would represent approximately 15% of the Mtwara Rural District's population (URT, 2004). These communities are predominantly of Makonde Malaba ethnic origin, which is the coastal sub-group of the main Makonde tribe of southern Tanzania, and the Muslim faith dominates (NEMC, 1998).

According to URT (1997), primary education is available to most people in the region, and access to education is likely to have improved thanks to the on-going UPE (Universal Primary Education) and MEMKWA (Mpango wa Elimu Maalum Kwa Waliochelewa) projects which target children who were late to enroll in school programmes. The literacy rate is 44% in the District according to the population census of 2002, with higher rates for men (URT, 2004). The health care situation is more challenging due to poor communications, poor infrastructure, poor water supply, and poor management of this infrastructure (URT, 1997).

2.2 Economic base and livelihood activities

According to the most recent population census, 85% of households are involved in agriculture in Mtwara Rural District (URT, 2004). Cashew nuts are widely produced and were found to be the main source of income for Mtwara, providing 25% of the Region's income in 1996 (URT, 1997). The importance of cashew nuts in the Marine Park is documented by URT (1997); NEMC (1998); and CONCERN (2004). These studies suggest that most households depend on subsistence farming, and on cashew as a cash crop. CONCERN (2004) found that the farming yields were low in the Marine Park area due to the low soil productivity, poor farming techniques, poor quality seeds, losses due to pests and wildlife (e.g. monkeys and wild pigs), limited extension services and unreliable weather patterns.

Prior to the establishment of the Marine Park, a quick socio-economic assessment was done by NEMC (1998) which showed that marine and coastal resource exploitation in the Marine Park included fishing, mangrove cutting, shell collection and trading, sea cucumber collection and trading, seaweed farming, and salt and lime production. The assessment also suggests that due to the high cost of running saltpans and the increase in imported salt, salt production has decreased significantly in the recent years in the Marine Park. Following the trend in Tanzania (Shao *et al.*, 2003), seaweed production was

developed in the Marine Park in 1997. At the time, it was carried out in Nalingu, Mnete, Mkubiru, Msimbati, and Mngoji.

2.3 Fishing

In 1996, the number of fishers in Mtwara Region was estimated to be 2050 (approximately 10% of the total number of artisanal fishers in Tanzania) whose catch contributed to 7.8% of the national artisanal catch (FFS, 1998).

NEMC (1998) suggests that fishing in the MBREMP area, as in other parts of Tanzania (Jiddawi, 2003), is mainly small scale. However, Mtwara fishers contribute to the regional income by exporting fish, prawns, lobsters, shells, octopus, sea cucumbers, shark fins and jaws (NEMC, 1998). For example Guard (2002) estimated that 103mt of Octopus were caught annually in the Mtwara area (including MBREMP) mainly for exported. Guard (2002) identifies the main octopus fishing area as Msamgamkuu, which is located on the edge of the Marine Park and includes extensive reef areas in the Marine Park.

The UNDP/GEF (2000), Obura et al. (2004) and Richmond (2004) note the use of beach seines, nets, spears, handlines, and tidal weirs in the Marine Park, similar to other parts of Tanzania.

Fishing activities in Mtwara Districts are carried out close to shore and are influenced by tidal and climatic patterns (Guard, 2002) as in other parts of Tanzania (Shao *et al*., 2003; Malleret King *et al*, 2003). Mtwara has one of the highest tidal ranges on the East African Coast of over 3 m (Guard, 2002). Guard (2002) notes that activities such as octopus fishing are mainly carried out at low spring tides.

The climate in Mtwara, as along the rest of the coast of Tanzania is dominated by monsoon winds, which influence the weather and coastal current patterns such as the East African Coastal Current (Guard, 2002). A longer rain period occurs in March to May, and shorter rainy season usually occurs in November (Shao *et al*., 2003).

The Southeast monsoon ('*Kusi*') winds prevail from May to October and the Northeast monsoon ('*Kaskazi')* winds prevail from November to March (McClanahan, 1988; Shao *et al*., 2003). It was found by Shao *et al*. (2003) that in Tanzania catches drop during the Southeast monsoon, partly because of the adverse fishing conditions (e.g. very strong winds). The effects of monsoon winds were also detected by Guard (2002), who found that octopus catches dropped in Msangamkuu during the Northeast monsoon when the wind direction made it difficult for the local fishers to get to sea.

2.4 Resource status

For Shao *et al*. (2003) marine and coastal resources are highly degraded in Tanzania due to their increased and unregulated use (increase demand for the resources, use of destructive gear, demographic increase, migration to coastal areas etc.). For Linden and Lundin (1995) dynamite fishing, the smashing of coral heads by nets and fishers trampling the reef, the use of poisons, the use of small-mesh nets catching juveniles, trawling and the use of beach seines on sea-grass beds are of particular concern to the marine environment. Semesi (1998) emphasised the fact that mangroves are also heavily used and show signs of overexploitation.

Furthermore, despite declining fisheries resources, Anderson and Ngazy (1998) found that fishers are reluctant to move out of the fishery, due to traditions, economic returns and the lack of alternative opportunities.

The literature suggests that MBREMP marine resources have not escaped this fate. According to Obura *et al.,* (2004), coral reefs show signs of overexploitation (e.g. a lack of large fish in surveyed areas in the Marine Park) and of degradation from destructive methods (e.g. beach seines and '*juya*'). In addition, Wagner *et al*. (2004) note that despite the fact that the MBREMP mangrove forest is one of the largest

and in best condition in Tanzania, it already shows signs of overexploitation (e.g. shift in species composition, small tree sizes in some areas). Finally, according to Richmond (2004), the intertidal area is over exploited and Muir *et al.* (2003) state that the Marine Park turtle population has been decimated for years.

2.5 Resource governance

In order to mitigate marine and coastal resources' degradation, a number of strategies have been developed at the national level, which have also been applied to Mtwara Region and thus to the Marine Park area.

For Shao *et al*. (2003) however, the most significant evolution for marine resource management in recent years in Tanzania has been the central government's recognition that increased involvement of local resource users in the management of their resources will achieve more sustainable coastal management. Raising awareness at the local level has also become a priority. The promotion of stakeholder participation in resource management is illustrated for example by the 1994 *Marine Parks and Reserves Act* where participation of and consultation with local communities is a requirement for establishing and managing a marine protected area. The act also recommends creating Village Liaison Committees.

For Shao *et al*. (2003) and TCMP/STWG (2003) the devolution of authority in natural resource management to the local level is illustrated by the fact that Local Government is now responsible for implementing and enforcing fisheries and other natural resource management initiatives through the Village Councils. These Councils have been given mandate to facilitate the establishment of community based institutions and by-laws to regulate resource uses in their area of jurisdiction. TCMP/STWG (2003) gives an example of a by-law developed by coastal communities around the Bagamoyo area who have made it compulsory for visiting fishers to report to local authorities and pay a fee.

The Village Councils also have to establish five committees one of which is the Village Environment Management Committee (VEMC), which has a legal mandate to manage natural resources at the village level (Shao *et al*., 2003). At the same time, the development of Beach Management Units (based on the model developed in Lake Victoria) to complement the marine resource related activities of the VEMCs, is promoted by central Government.

Similarly, Mangrove Protection Committees were established by the NORAD funded National Mangrove Management Project. These are responsible for mangrove management at the village level, and charge a fee for mangrove exploitation on behalf of the District Natural Resources Department (NEMC, 1998).

However Shao *et al*. (2003) and Malleret King *et al*. (2003) found that due to the lack of resources and sometimes due to political patronage, local committees are often ineffective and marine resources continue to degrade. For Bagamoyo-ICM (2003), TCMP (2003) and TCMP/STWG (2003) these dysfunctions are particularly noticeable in the case of areas where no specific coastal resource management programmes, such as the Tanga Coastal Management and Conservation Programme, exist.

MBREMP communities have been part of the national trends and all have established VEMCs. In addition, as required by the *Marine Park and Reserve Act* (1994), Village Liaison Committees were also created in all MBREMP villages when the Marine Park was established. The Marine Park authorities may develop and enforce coastal management regulations that supersede other natural resource legislation within the Marine Park, however the MBREMP is still within the jurisdiction of the local Government (King, pers. comm.). Outside the Marine Park, District authorities, especially the District Fisheries office and the Mangrove Management Project are responsible for enforcing of fisheries and mangrove related regulations (NEMC, 1998).

2.6 Opportunities in the MBREMP

The literature suggests that opportunities for MBREMP stakeholders are likely to be developed. Economic opportunities may arise with the development of the Mtwara Development Corridor Project (MtDC), a South African Development Bank supported initiative that aims to promote economic exchanges between Malawi, Tanzania, and Mozambique. The Project promotes economic development in the corridor area. The MtDC project considers MBREMP as a key attraction with its wealth of marine resources and sandy beaches (Simbakalia, 2002; MtDC Project Manager, pers. comm.).

Other opportunities are facilitated by locally based development programmes such as CONCERN (Tz) which has, for five years, promoted a project which aims at 'improving crop production, storage and marketing processes' in 3 Wards of Mtwara Rural District, one of which is located within MBREMP (CONCERN, 2002). This project is expected to build people's capacities to identify ways of increasing their incomes. The successes of such programmes may reduce people's reliance on marine products.

Other projects, which may have benefited the MBREMP villages, include the Rural Integrated Project Support Programme (RIPS). The Finnish funded project has concentrated in the last fifteen years on facilitating the development of Community Based Organisations (CBO) in order to build communities' capacity to manage their resources (RIPS, 1998).

One of the CBOs considered as most successful is SOZOCO (Southern Zone Confederation for the Conservation of the marine environment), most commonly known as '*Shirikisho*'. Coastal communities developed the organization in 1996 in Kilwa, Lindi, and Mtwara Districts. It major goal was to end dynamite fishing which. SOZOCO extends its mandate to the general protection of the marine environment and the promotion of community based alternatives on natural resource management (1998). Since 1998 RIPS has collaborated with SOZOCO to initiate projects to support unemployed youths most of whom were formally involved in dynamite fishing such as fish and sea weed farming (NEMC 1998), this with mitigated success (RIPS, 1998). It has been noted however that SOZOCO has not had support from RIPS in recent years and may no longer be as effective as it once was (King, pers. comm.).

One of RIPS activities has also been to improve access to credit for fishers in the Region (RIPS, 1998). Credit opportunities are often scarce for fishers in Tanzania (FANRM, 2003; Malleret King *et al.*, 2003). The latter studies identified the lack of access to funds as a major constraint to the livelihood development of fishing households, affecting gear choices in particular. Indeed, Malleret King *et al* (2003) identified that the lack of adapted credit facilities (e.g. prevailing high interest rates and inappropriate conditions, few working revolving funds, or ineffective cooperatives) often forced young fishers to enter destructive fisheries (e.g. join beach seine crews).

MBREMP will be able to build on lessons learnt by RIPS, such as credit opportunities, development of income generating activities from small-scale cashew processing, and so on (RIPS, 1998). Thus in order to improve the economic status of Marine Park communities, the Marine Park can benefit from synergies with a number of activities and organizations in the area to contribute to the development of opportunities for Marine Park communities (NEMC, 1998) while improving the status of the resources.

2.6.1 Summary

The literature suggests that fishing is an important activity in the MBREMP and is carried out in a similar way to the rest of Tanzania. It is small-scale and mainly provides fish for local markets, although a number of products are exported.

The Marine Park is located in a poor area of Tanzania where marine resources are likely to be an important source of livelihoods. These resources however are showing signs of overexploitation due to intense use, high demand and use of destructive fishing gears. Other livelihood opportunities for local people may arise with the conjunction of the establishment of the Marine Park (including promotion of

tourism, protection of the resources), the work of NGOs, and the promotion of economic development through the Mtwara Development Corridor Project.

Facts on the communities living in the Marine Park are however scarce in the literature. Dependence on marine resources is suggested, although little is known on the extent of this dependence. It is suggested that marine resource uses are similar to those of other areas on the Tanzanian coast but little information is available, similarly no comprehensive information on the wealth status of MBREMP communities specifically was found.

The aim of the socio-economic baseline assessment will thus be to fill these gaps. Understanding better the way in which people use the marine resources, and their dependence on the marine resources will help the Marine Park find avenues for improving management and contribute to the development of additional livelihood opportunities for the local communities.

3 General Occupational structure and dependence on marine and other resources in the Marine Park

Dependence on marine resources (proportion of households involved in marine resources related livelihood activity, importance of marine related activities in the household's livelihood system) is an indicator of potential threats to marine resources. The more households are dependent on marine resources for their livelihoods, the more they are likely to be defensive about their activity, and reducing pressure on marine resources by zoning activities or banning certain gears without acceptable alternatives proposed may be difficult. This section concentrates on evaluating how much Marine Park communities depend on marine resources.

Dependence on other natural resources (wood, wild plants, mangroves…) was also investigated at a broader level as these may by essential for the integrity of the marine ecosystem to be preserved (e.g. mangrove forests, terrestrial coastal forests). Furthermore, these other resources are part of the attraction of the Marine Park.

3.1 Demographics/Marine Park stakeholders

The occupational structure provided information on a total of 4958 households from 11 villages. Due to the difficulty of accessing Nalingu, the village was not included in this research. Although some households may have been omitted, it is believed that most households were listed. This list will constitute a good sampling frame for further research.

When investigating the occupational structure, information on the number of household members, the number of active people in the households was also required. Similarly the household size was investigated in the household survey in selected villages (refer to part 1.4.4). Table 4 summarises this information.

Table 4: Village size and breakdown of Marine Park households

	Occupational structure				Survey
Village	**Number households**	**Household Size**	**Active members**	**In % of the Marine Park households ***	**Household Size**
Mkubiru	199	3.6	2.1	4.0	
Mngoji	434	3.6	2.1	8.8	3.0
Msimbati	911	3.7	2.1	18.4	5.1
Madimba	453	3.9	2.1	9.1	
Mitambo	347	3.5	1.9	7.0	
Litembe	323	3.4	1.9	6.5	4
Tangazo	921	3.8	2.2	18.6	4.1
Kilambo	563	3.3	2.2	11.4	
Mahurunga	222	3.7	2.1	4.5	4.6
Kitunguli	313	2.3	1.1	6.3	
Kihimika	272	4.1	2.1	5.5	
MBREMP	***4958***	***3.5***	***2***	***100.0***	

* Excluding Nalingu

The largest villages, in descending order, are Tangazo, Msimbati, and Kilambo, which amount to 47% of the Marine Park's households (excluding Nalingu). On average, households in the Marine Park were found to have 3.5 members, out of which two contributed income of subsistence generation. This is

believed to be low and it is suspected that key informants had omitted children. Results of the household survey show a higher household size in some of the villages surveyed, which is more consistent with the District average of four members per households (URT, 2004).

The proportion of women headed households (WHH) was also investigated (see Table 5) in the household survey. Results showed that on average 18% of the households surveyed in the selected villages were headed by women (not married or widows), and that 9.7% were widow headed households.

Table 5: Women (WHH) and Widow headed households as a percentage of households surveyed

Village	% WHH	% of widow headed households
Litembe	15.2	4.3
Mahurunga	14.4	3.4
Mngoji	26.1	19.3
Msimbati	21.9	13.5
Tangazo	13.6	7
Total	***18.1***	***9.7***

In the surveyed villages, the percentage of widow headed households was highest in Mngoji and Msimbati.

3.2 A wide range of activities in the Marine Park

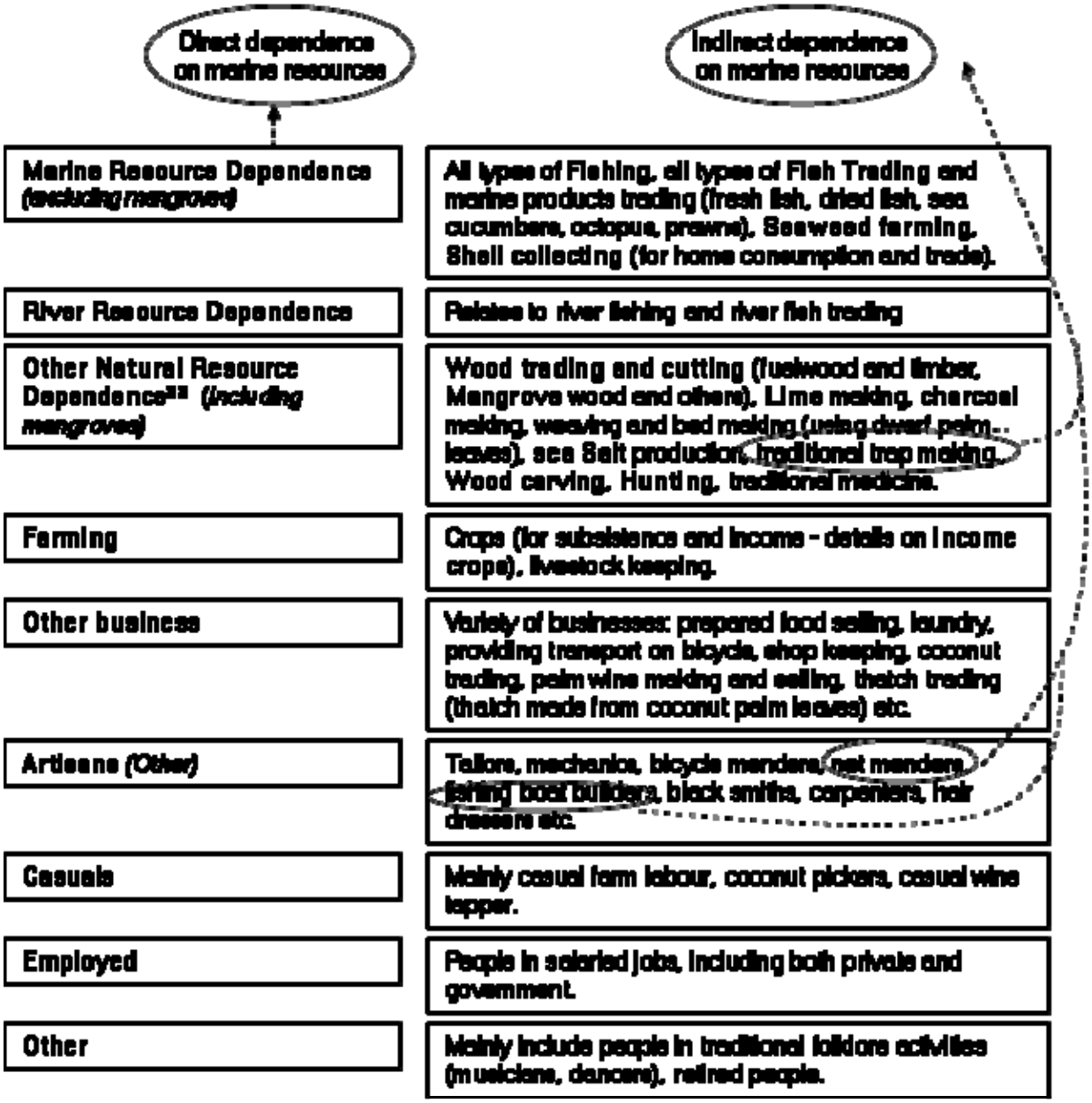
The occupational structure survey showed that there is a wide array of activities carried out in the Marine Park. These include marine related activities such as fishing, seaweed farming, and shell collecting, and trading fish, prawns, sea cucumbers, and octopus. Other activities include river based fishing and river fish trading, other natural resource exploitation such as wood cutting and trading (including mangrove wood), charcoal production, palm weaving, sea salt production, and farming for income or subsistence.

Traditional activities such as traditional medicine, dancers and drummers 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 tapping and trading, shop keeping etc.

The average number of activities per household is 1.9 for all the surveyed villages, the highest average being in Msimbati where households are larger.. Overall, the occupational structure shows that on average households are involved in 1.73 categories of activities (see Figure 1 for the definition of categories of activities). The occupational structure study also shows that marine resource dependent households were involved in a significantly higher number of categories of activities than other households were involved in (2.03 on average for households involved in marine resource associated activities and 1.34 on average for other households; Malleret and Simbua, 2004).

Fifty-five activities were identified through the occupational structure survey, most of which were also identified in the household survey, where 50 activities were identified (see list of activities in Appendix 8). 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 that are of focus and on which details will be provided

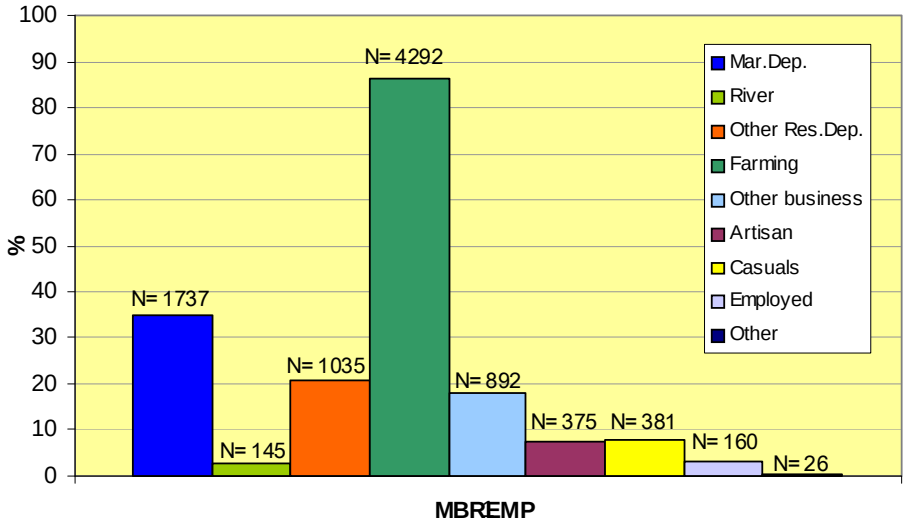
** Activities dependent on other natural resources are activities such as businesses or artisans that are separated from the general activity categories because although these activities are not the primary focus of the Marine Park, they may impact existing marine and coastal biodiversity if not carried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

3.3 General occupational structure of the Marine Park

The occupational structure data shows that 35% of the Marine Park households are involved in marine resources associated activities (depend on marine resources at least for part of their livelihood).

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

(Source: Occupational structure)



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

At the Marine Park level, findings show that on average household livelihoods are composed of 1.73 categories of activity. 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, this structure is not homogeneous across the Marine Park and varies according to villages as shown in Map 1. Map 1 suggests that villages can be grouped according to their geographic location, based on their proximity to the sea, to the river, and the mangrove area. This illustrates the relationship between the physical environments and livelihood activities.

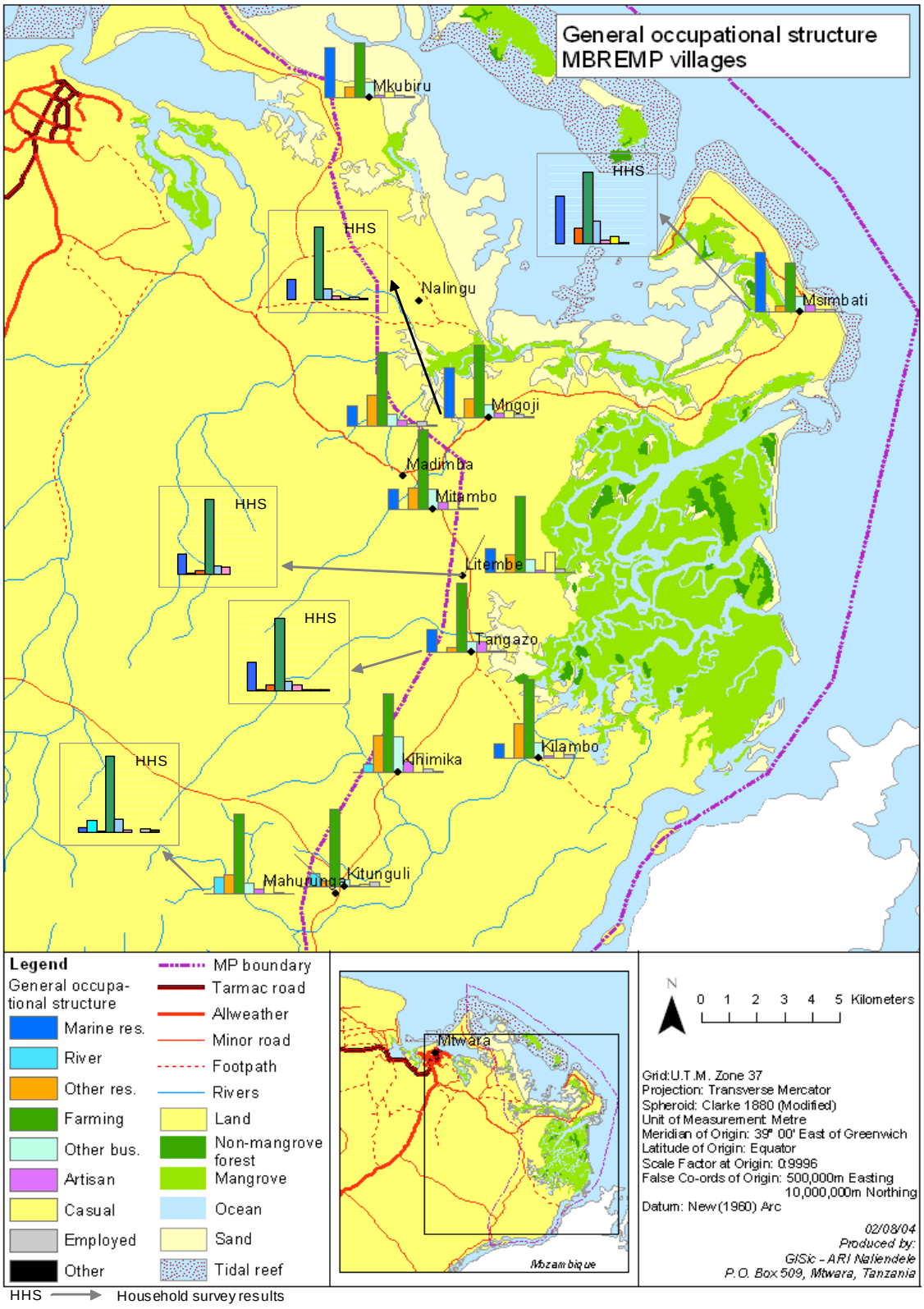
Villages can be grouped as follows:

- 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 listed households.
- Other: Kihimika, which is, located the furthest from the sea, river, or mangrove (5.5% of the listed 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 infrastructure might have an impact which were not analysed in this study.

Map 1: Occupational structure at the community level

(Source: occupational structure and household survey)



As shown in Map 1, the proportion of households involved in marine resources associated activities (dependent on) are highest in sea bordering villages. More than 60% of their households are involved in marine associated activities (74% in Msimbati). In these villages, farming is still one of the most important activities with 80% households farming in Mngoji. Msimbati and Mkubiru are the villages with the least farming households (60% and 61% respectively) within the Marine Park. Findings of the household survey confirm the occupational structure results except for Mngoji where the proportion of households involved in marine related activities was found to be much lower in the household survey than in the occupational structure. However, the focus groups results tend to confirm the occupational structure (100 fishermen and women and over 100 shell fishers were identified by the focus groups).

Fisheries resource dependence (fishing and fish trading) in Mahurunga, Kitunguli, and Kihimika mainly refers to river resources although a crew of fishers from Kihimika was identified to be fishing in the mangroves during the focus group interviews. 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). A small amount of marine fishing was however identified in Mahurunga by the household survey (5% of the household surveyed) which in general confirmed the results of the occupational structure.

In most villages, farming is by far the most widely spread activity with between 87% and 99% households involved. However, although secondary, the marine and fisheries resources associated activities are still significant in the mangrove villages with between 20% (Kilambo) and 30% (Litembe) households involved in such activities. A small amount of river fishing was detected in Litembe and Tangazo through household surveys (1 and 2% of the household surveyed).

In terms of volume, the highest numbers of households involved in marine resource associated activities were found to be, in decreasing order, Msimbati, Mngoji, Tangazo and Mkubiru, the most fishers and shell fishers being in Msimbati, Mngoji and Tangazo.

Businesses (related to "other" natural resources and non natural resource based) are an important component of the communities' occupational structure. They 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 (mangrove villages). The household survey shows a lower percentage of households involved in such activities except for Msimbati, this is probably due to the unwillingness to disclose some of the activities. 20% of the households in Msimbati were found to depend on other resources for part of their livelihood.

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 an important part of a community's economy and essential at the household level for income, both for men and women who are mainly involved in small businesses such as food vending, small stands etc. Results of the household survey confirmed the occupational survey results.

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. These results were confirmed by the household survey.

Finally casual labour, which is mainly farm labour (including coconut pickers) can be a last resort for getting an income, and is notably important in Litembe (25% of households) and Kihimika (22% of households).The figure was slightly lower for the village surveyed in the household survey.

The 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 teachers, police officers, nurses etc. This was also found in the household survey where 5% and less of the households depended on salaried employment.

Thus throughout the Marine Park natural resources (marine or other) are an important source of livelihood. Dependence (proportion of households involved in) 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.

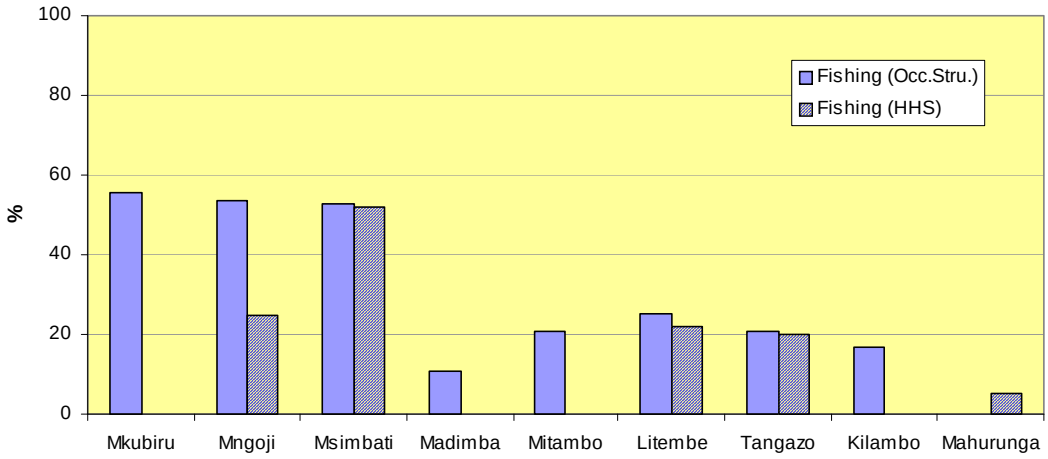
The level of dependence on marine resources was examined further, and results are presented in the section below.

3.4 Focus on fishing

3.4.1 Is fishing an important source of livelihood for the Marine Park communities?

Fishing came out as one of the most important activities for the sea front villages and a number of mangrove villages from both the household survey and the occupational structure survey. It was found that 26% of Marine Park households depend or are involved in fishing (54% for the sea bordering villages households and 19% of mangrove bordering village households).

Figure 3: Percentage of households involved in fishing per village



Occ. Stru: findings from the occupational structure survey
HHS: Findings from the household survey.

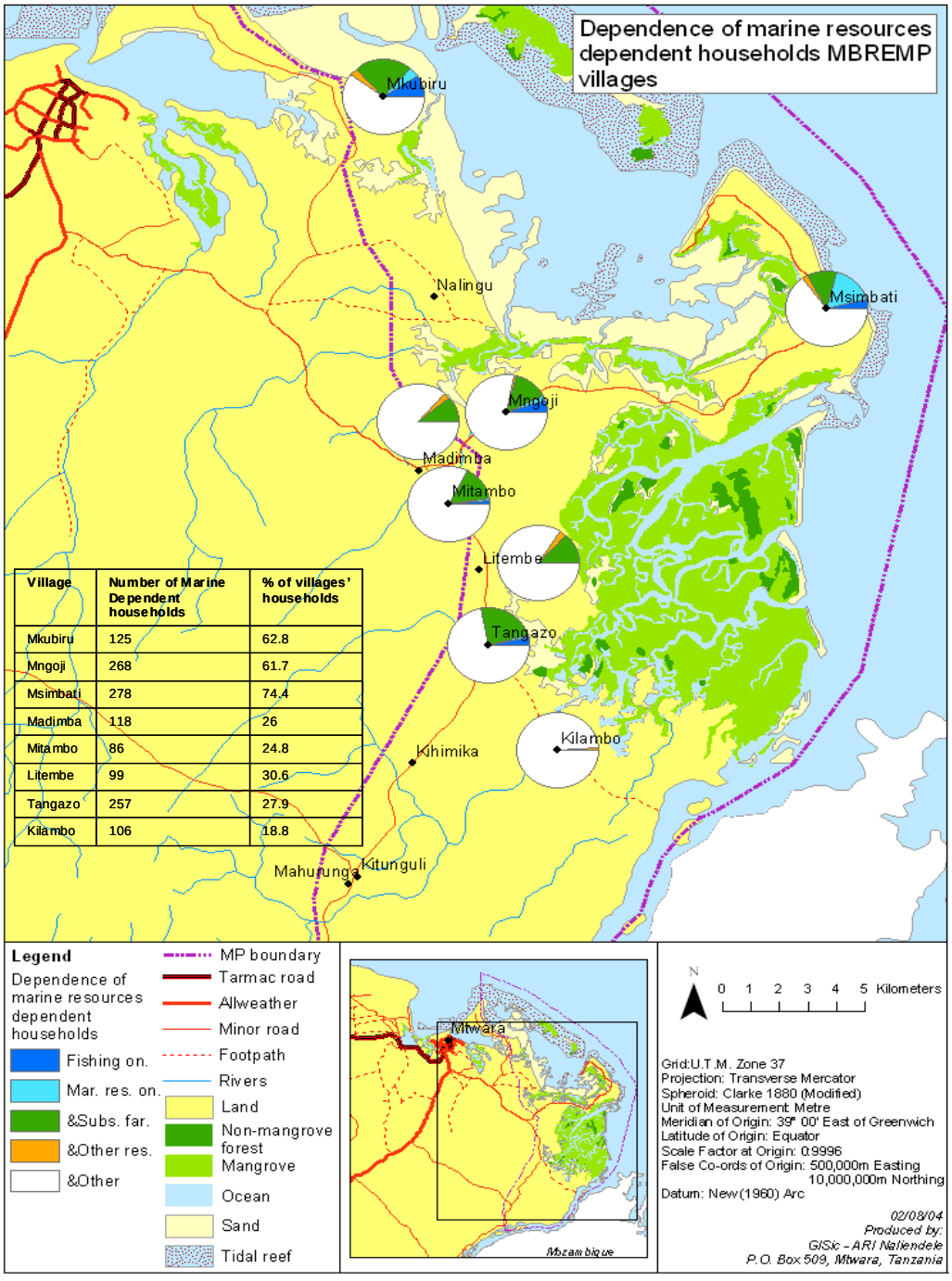
As shown in Figure 3 results were similar in the household and occupational structure surveys for Msimbati (52% instead of 54%) and for the mangrove villages (19-22%) but lower (25% HHS) for Mngoji than in the occupational structure survey. Results of the Mngoji focus group discussions suggest that the household survey results may be more accurate. The focus groups identified 141 fishers. The number of fishers does not correspond to the number of fishing households however, and often more than one fisher operates in one household. According to table 7, there are 1.2 fishers on average per fishing household in Mngoji. One hundred and forty one fishers would thus be distributed among 118 households. Therefore, the percentage of fishing households in Mngoji would amount to 27% of the total number of households in the village.

The higher number of fishing households identified during the occupational structure may come from the fact that occasional fishers, particularly occasional hand line fishers were taken into consideration whereas they may not have been in the household survey.

3.4.2 Dependence on fishing and other marine associated activities at the household level

To appreciate better how much Marine Park communities depend on fishing and other marine associated activities, further analysis was carried out to establish the proportion of households relying solely on marine resources for their livelihood. These results are illustrated in Map 2. The table on the map shows the number of households and proportion of the village's households they represent.

Map 2: Level of dependence on marine resources (income and subsistence) for marine resources dependent households. (Source: Occupational structure)



As illustrated by Map 2, few households depend only on *fishing*, (9.6% of Mkubiru and 3.8% and 5.2% in Msimbati and Mngoji of the marine dependent households). However, a fifth of households involved in marine activities in Msimbati 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 the marine resource base or exploitation regimes.

Although the proportion of households only dependent on fisheries and other marine related activities is low in most villages, it is relatively higher in Msimbati, Mkubiru, and Tangazo (mangrove area) where it amounts to a third or more of the marine dependent households. This was found to be higher than in other parts of coastal Tanzania (Malleret-King, 2003) and than in the household survey.

Most households involved in marine resource associated activities 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).

Fishing was however considered as the most important source of income by on average 69% fishing households (78% in Msimbati, 64% in Mngoji), the other important source of income of fishing households is farming (on average 25% of the fishing households). Findings are presented in Table 6.

Table 6: Marine dependent activities as the main source of income, % fishing, % trading etc

Activities ranked first as main source of income	Mngoji	Msimbati	Litembe	Tangazo	Mahurunga
Marine Related	15.7	43.6	16.0	21.1	10.0
Of which fishing	85.7	89.0	85.7	56.4	100.0
Of which Trading	14.3	9.7	14.3	43.4	
Fishing households					
Fishing as main source of livelihood	64.7	78.0	66.7	65.6	47.4

(Source: Household survey).

3.4.3 Time committed to fishing

The number of fishers per fishing household (household involved in fishing) was investigated in the household survey. Results show that the average number of fishers per fishing households is highest in Msimbati (3.7) and lowest in Mahurunga (1) as shown in Table 7.

Table 7: Average number of fishers per household at the village level

Village	Average of number per household
Litembe	1.3
Mahurunga	1
Mngoji	1.2
Msimbati	3.7
Tangazo	1.16

(Source: Household survey)

Fishing is not always carried out full time. Most fishers also contribute to the households farming activities whether for commercial or subsistence purposes. Findings from the household survey show that fishers go to sea 5 to 6 days a week and most of them have at least one month off fishing in the

year to perform other activities. Table 8 shows the average number of days off per month and months off fishing per year in each village.

Table 8: Average number days and months off

Village	Average number days off fishing per month	Months off fishing
Mngoji	5.75	1.14
Msimbati	8.2	2.2
Litembe	10.3	3.3
Tangazo	8.3	2.2
Mahurunga	8.8	3.8

(Source: Household survey)

Significant differences were found in the number of months off fishing according to the villages ($F=16.1$ $p<0.001$). On average, the seafront villages fish longer in the year and more days per week than other villages.

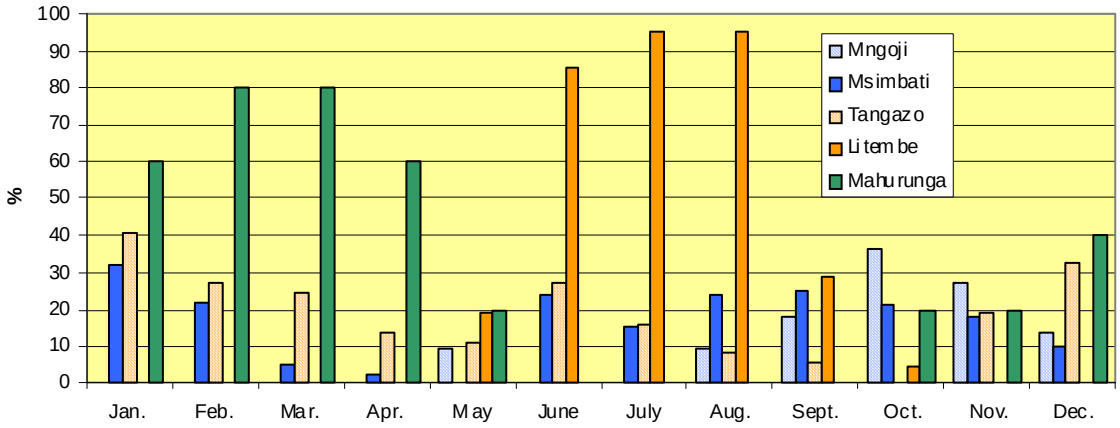
In order of importance, the reasons mentioned for not going fishing on a weekly basis include religion (most fishing households), gear and boat repairs, other activities, and tides.

On a monthly basis, a high percentage of fishers (27% of fishing households surveyed in Tangazo and 83% in Msimbati) do not go fishing at the coming of the neap tides for two or three days because fish are considered scarce. Spring tides are considered best. This was confirmed in the focus groups.

Farming activities (preparing the land particularly), strong winds, and river flooding in the case of Tangazo are the most common reasons for fishers to take months off fishing. For 60 to 80% of the fishing households surveyed (except in Tangazo) farming, particularly the preparation of land and harvests were given as a reason for not going fishing for a month. Figure 4 illustrates the yearly fishing patterns for the different villages.

Figure 4: Percentage of households taking months off from fishing per village

(Source: Household survey)



January, February, March, June and July were found to be the main months taken off for the purpose of farming (60% of households grow cashew nuts in the Marine Park). Strong winds in June, July and August are considered as adverse conditions for fishing and some fishers are reluctant to go to sea.

Table 9: Percentage of fishers fishing per number of months

Number of months fishing	Litembe *N=21*	Mahurunga *N=5*	Mngoji *N=22*	Msimbati *N=97*	Tangazo *N=37*
More than 11	0	20	100	69.072	54.054
7 to 11	100	80	0	29.897	43.243
4 to 6	0	0	0	0	2.703
Less than 4	0	0	0	1.031	0

(Source: Household survey)

Most fishers fish all year round in Msimbati, Tangazo and Mngoji where fishing households are numerous. However, 43% of fishers were found to take 1 to 3 months off fishing per year in Tangazo. In Litembe and Mahurunga, the majority fish less than 11 months but more than 6 months (see Table 9). Very few households are involved in fishing for less than half the year or fish occasionally (less than 4 months per year in total). Occasional fishing was only detected in Tangazo and Msimbati (1 and 2 %).

Most fishers are involved 5 to 6 days a week for most of the year. Overall the most time spent fishing is in Mngoji, and the least in Litembe.

3.4.4 Is fishing enough to sustain the household?

Despite the fact that fishers are mostly engaged in the activity all year or three quarters of the year, 5 or 6 days per week fishing was often considered insufficient to sustain the households.

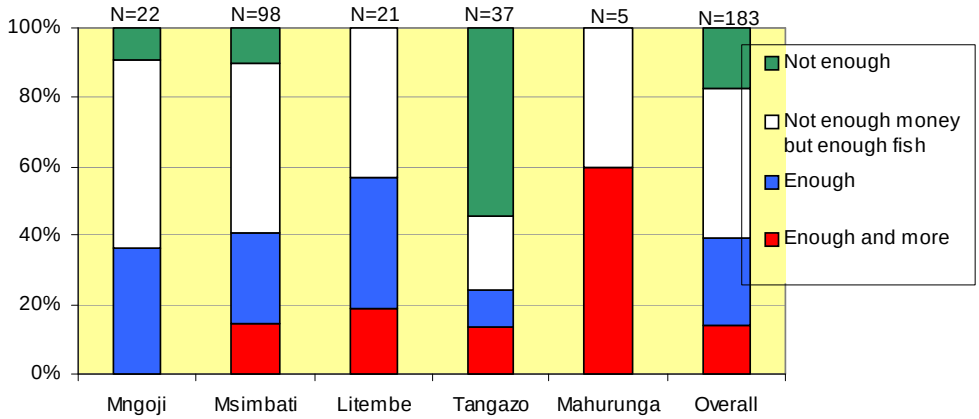
Households were asked whether fishing provides:

1. enough and more to the household in terms of income,
2. just enough to break even,
3. not enough income but enough food (fish)
4. not enough income and not enough fish.

The findings show that a minority of households considered fishing to provide enough and more to sustain the household (14% overall, none in Mngoji and a high percentage in Mahurunga). A quarter of the fishing households considered that fishing brought just enough in terms of food and income, but the largest majority (43% overall) considered fishing to provide enough food (fish) but not enough income to sustain the household. A minority overall considered that fishing brought not enough food or income, except in Tangazo where this concerned more than 40% of the households.

Figure 5: Is fishing considered enough as a source of food and income for the household (in proportion of fishing households).

(Source: Household survey)



On average in mangrove villages, the proportion of households was more equally shared among the four statements than in the seafront villages where statements 2 (enough to break even) and 3 dominate (not enough income but enough fish to eat for the household).

This confirms again that very few households depend only on fishing or only on marine resources for their livelihood as was found in the occupational structure, and is comparable to findings of previous studies (Anderson and Ngazy, 1998; Malleret King *et al*., 2003).

3.5 Summary

The occupational structure provides information on the number and percentage of households involved in fishing activities and other marine resource associated activities, thus on the general dependence on marine resources at the community and Marine Park levels. Results of this occupational structure could not provide comprehensive information on the dependence on fishing at the household level. The level of household dependence on fishing and other marine resources was thus investigated further in the household survey, particularly by researching the time committed to fishing, and how fishing ranked in relation to other household livelihood activities.

It was found that more than a third of the Park households are involved in marine resource related activities (35%), with the percentage of households involved being particularly high in the seafront villages (up to more than 60%). This is comparable to findings in other areas on the East African coast (Malleret King *et al*., 2003). In addition, the household survey showed that, at the household level, time commitment to fishing is high. Fishers fish on average 5 to 6 days a week and their days off are generally devoted to religious practices or gear repair and maintenance. Most fishers in seafront villages and Tangazo fish all year round. Most fishers in Litembe fish at least three quarters of the year (see Tables 8 and 9).

The household survey also showed that fishing is considered as the main source of income by the majority of fishing households surveyed except in Mahurunga despite the fact that a high percentage of these households do not consider fishing as a sufficient source of income to sustain the households (see Figure 5).

All the above suggests that the level of dependence on marine resources at the household and Marine Park levels is high, especially in seafront villages and Tangazo.

However, it was also found that few households depend solely on marine resources associated activities for their livelihoods. Most farm as well and/or have another activity, which suggests that although there is a high dependence on marine resources, households spread their livelihood risk by carrying out a number of activities. The highest percentages of households that depend solely on marine resources for their livelihood were found in Mkubiru, Msimbati, Tangazo and Mngoji (see Maps 1 and 2).

4 Understanding better fisheries related livelihoods

To understand fisheries livelihoods, it is essential to identify who is involved in and who influences (e.g. through demand) fisheries associated activities; that is who the stakeholders are.

4.1 Who are the Marine Park marine resource stakeholders?

Stakeholders were identified based on the occupational structure data, focus groups information, household survey results, and key informant interviews. Findings are summarized in Table 10.

Table 10: Marine Park fisheries stakeholders

Stakeholders		**Type of activity**	**Origin of stakeholder**
Primary stakeholders	Fishers	Set Nets Hand lines/long lines Beach seines Spear guns Spear/hand diving Traps Tidal weirs *'Tandilo'* *'Juya'*	Marine Park villages and outsiders- including from Mtwara, Ngao, Msamgamkuu…
	Shell fishers and traders	For shells, meat and lime	Marine Park villages
	Seaweed farmers		Marine Park villages (Nalingu, Mkubiru)
Secondary stakeholders operating in Marine Park villages	Traders, Agents, Exporters	Fish/ *'dagaa'* (dry or fresh) traders	Marine Park villages and outsiders (as far as Newala, Tandahimba, Mahuta, Nachingea, Masasi…)
		Sea cucumber traders, agents and exporters	Marine Park villages (mainly Msimbati). Seasonally Chinese exporters base themselves in Msimbati.
		Octopus, lobster traders and agents	Marine Park villages. Agents collect in Msimbati and Namponda mainly.
		Prawn, lobster, crab traders	Masasi, Newala, Mikindani…
	Seaweed farmers	Agent for Zanzibar based Company	
	Boat builders		Marine Park villages
	Net menders		Marine Park villages
	'*Tajiri'*	Rich boat and gear owners who employ crews to fish	Msimbati
	Consumers		Marine Park villages
Secondary stakeholders Operating in Mtwara and outside the Marine Park	Agents	Shells (including opercula) Sea cucumbers, shark fins, swim bladders Fishmongers	10 in Mtwara 3 in Mtwara
	Gear sellers	2 shops	Mtwara

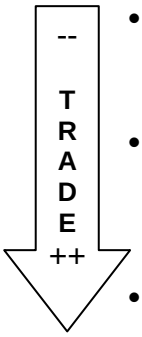
	Agent/Exporters	Buying depot (fish, lobster, octopus..) ice providers Shells (opercula and shell)	Mtwara but processing in Dar es Salaam an Mafia Mtwara
	Consumers		Mtwara and around, Newala, Masasi etc.
Institutions	MBREMP	Marine Park in charge of management	Main base in Mtwara but future base in Msimbati
	Fisheries Division	Fishing licenses	Main base in Mtwara
	Village Liaison Committee	Intermediary between MBREMP and villages	Marine Park villages
	Honorary rangers	Marine Park enforcement and monitoring	Marine Park villages
	VEMC	Control of resource use in at the village level	Marine Park villages
	Village Councils	Control of fish and other marine product trade, outside fishers	Marine Park villages

(Source: all research components)

Marine Park fisheries stakeholders include:

- Fishermen and fisher-women from the Marine Park, from around the Marine Park and further afield;
- Shell fishers (mainly men, women and children from the Marine Park);
- Seaweed farmers (men and women in Mkubiru and Nalingu);
- Traders, agents and dealers/exporters of fish (fresh and dried), shell, sea cucumber, octopus, prawn, lobster (men and women from the Marine Park, from Southern Tanzania or from abroad).

For clarity:



- **Traders** are people buying fish locally or around the Marine Park area (including Northern Mozambique), and selling to local customers or to traders at the local level or at the Southern Tanzania level. They operate on a small or medium scale.
- **Agents** are people who buy products from traders or local fishers on behalf of exporters or large dealers who operate from abroad or from Dar es Salaam or Zanzibar. Agents are given money to buy the products for the exporters or larger dealers. They operate on a larger scale than local traders do.
- **Exporters/Dealers** operate on a large scale and target up country or foreign markets, they buy from agents, traders or directly from fishers.

These categories may overlap, as someone may be an agent as well as an exporter. However, they give an idea of the scale of the trade involved.

Stakeholders also include:

- Net menders, boat builders, and richer boat owners who may be located in or outside the Marine Park ('*Tajiri*');
- The Marine Park authorities;
- The Fisheries Division (in charge of fishing licenses);
- Village Councils (in charge of informal trading licenses);
- Local Environment Management Committees (mandated to facilitate the development of environment focused Community Based Organisations and controlling natural resource uses at the village level). VEMCs may have become redundant because of the establishment of the Marine Park Village Liaison Committees.

The sections below focus on describing resource use patterns related to fishers, seaweed farmers, shell fishers, and marine product traders. Prices and costs will be expressed in USD (with one USD equivalent to 1000 TSh).

4.2 Fishing systems, use patterns

A number of fishing gears and methods are used by Marine Park fishers such as beach seines, seine nets (referred to as *'juya'*), set nets, traps, lines (hand lines and long lines), spears, spear guns, diving, gleaning etc. Use patterns vary according to gear and fishing methods. Marine organisms harvested include demersal and pelagic fish, shells, octopus, sea cucumbers, prawns, squid, crab, and lobster.

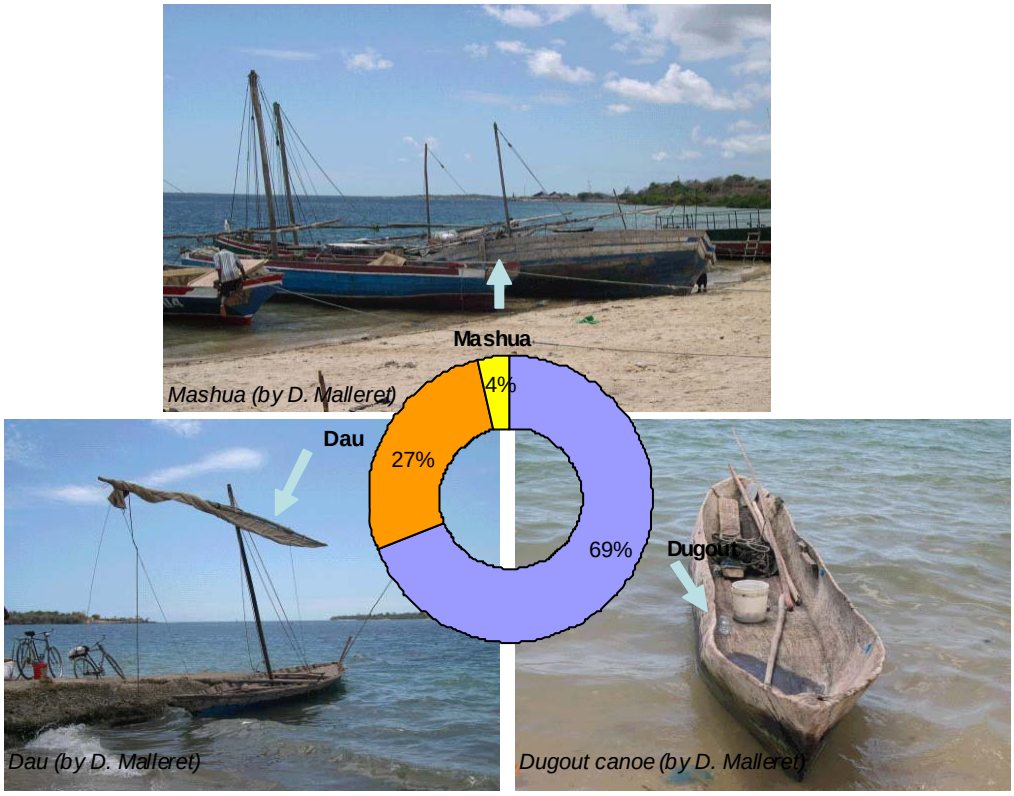
Fishing use patterns presented in this section, relate to the equipment used, the timing and location of activities etc. (Bunce *et al*., 2000). Perceived changes and conflicting issues are also examined at the end of this section.

4.2.1 Boats

Fishing in the Marine Park is artisanal and mostly small scale and is done for food and income. The majority of fishing boats are dug out canoes (69%) and *'dau'* (27%) as shown in Figure 5. Dug out canoes are made of a single tree trunk, these can be of several sizes (from one fisher up to 6). *'dau'* are larger double ended sailing boats made from planks and are wider and usually longer than dug outs, up to about 30 feet long. Other boats used to a lesser proportion (4% of the boats used) are square ended sailing boats (*'mashua'*) which tend to be the biggest boats (see photos). The few boats that are motorised (outboard engine) tend to be *'mashua'*.

Figure 6: Types and proportion of boats used

(Source: Household survey)



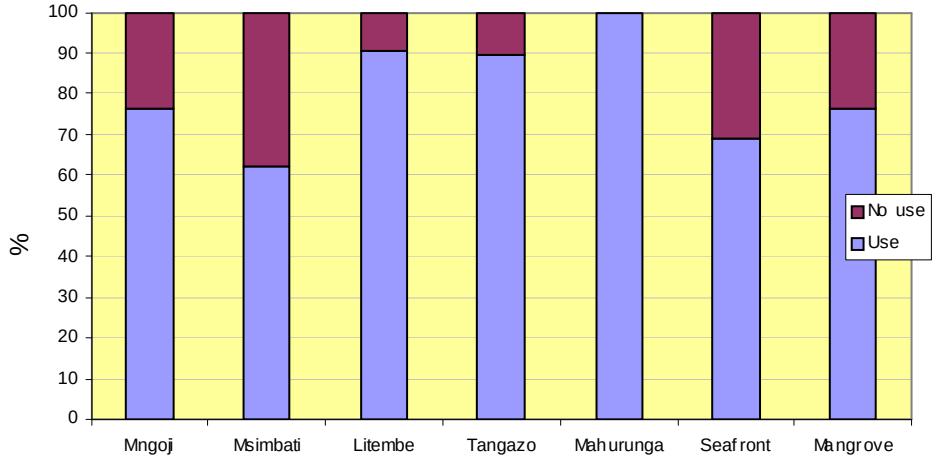
Most boats are sailed or poled. None of the fishers surveyed used motorized boats. Some motorized boats can be seen in the Marine Park but these are operated from outside the Marine Park, particularly from Mtwara.

Boats are used for most gears. A small number of net fishers and a large proportion of trap fishers were found not to use boats. *'Tandilo'* fisher women do not need boats to fish but sometimes hire boats to get to islands where they stay in temporary fishing camps (in Bahasha and Litokoto islands in the River estuary for example). Similarly, tidal weir fishers do not need boats to carry out their activity.

The household survey showed that most fishing households use boats (see Figure 7).

Figure 7: Proportion of fishing households using boats

(Source: household survey)



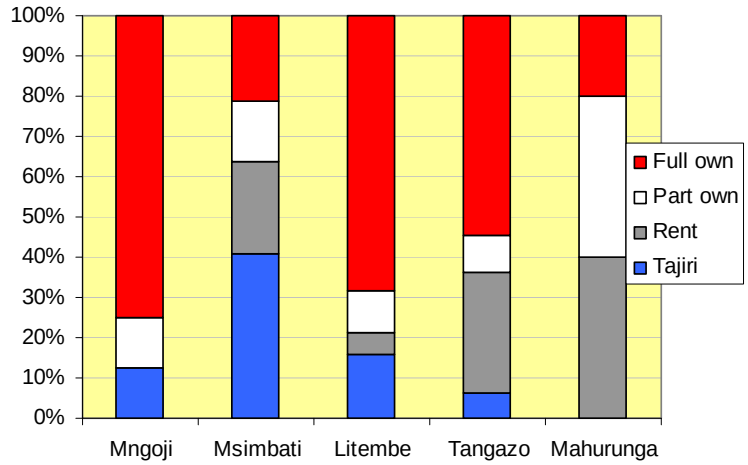
Although most fishers have access to boats, a lower proportion of fishers use boats in Mngoji (23%) and Msimbati (38%) than in Litembe, Tangazo and Mahurunga. This may be due to the higher proportion of fishers who dive or use spears, tidal weirs and traps in Msimbati and Mngoji.

Boats may be fully or partly owned or rented. Commonly several fishers use one boat (2 or 3), the catch is divided amongst the crew and the boat and/ or gear owner. The total number of shares equals the total number of crew, plus the boat owner, plus one for the boat. Thus two out of the total number of shares are given to the boat owner. Other fishers, particularly *'juya'* fishers in Msimbati, use boats owned by '*tajiris*'. '*Tajiri'* employ fishers who get a share of the catch. In addition, agents (20 motorised boats) for an octopus exporter based in Mtwara, hire fishers in Msimbati to fish octopus in Mozambique 8 to 10 days a month on a regular basis.

Figure 8 illustrates the different type of boat ownership in proportion of fishing households.

Figure 8: boat ownership (in percentage of fishing households)

(Source: Household survey)



The majority of households fully owned boats (mainly dugout) in Mngoji (75%), Litembe (70%), and Tangazo (55%) but not in Msimbati and Mahurunga where only 20% did. Renting boats is most common in Msimbati, Tangazo, and Mahurunga.

Table 11: Type of boats owned

Location	**Proportion of boat owning households (%)**	**Boat owned according to type (fully and partly) (%).**			
		Dug out	*'dau'*	Boat	N
Mngoji	87.5	93	7		14
Msimbati	36.7	22.7	63.6	13.6	22
Seafront					
Litembe	78.9	100			15
Tangazo	63.6	95.2	4.8		21
Mangrove					
Mahurunga	60	100			3

As shown in Table 11, most boat owners own dugout canoes, except in Msimbati (where 63% own a *'dau'* and 13.6 % *'mashua'*).

4.2.2 Fishing Gears and Methods

A wide spectrum of gear is used in the Marine Park such as set nets of various mesh sizes, beach seines, seine nets (*'juya'*), hand lines, long line, spears, *'tandilo'* , traps and tidal weir etc. Fishers also dive to catch shells and sea cucumbers. Although Beach seines were common in the Marine Park, Marine Park authorities have recently started to enforce a ban on this gear, but some crews continue to operate, particularly from Nalingu village and one crew in Msimbati.

4.2.2.1 Gear types

→ Nets

Set nets: of 3-4 ply and of 2.5-3 inch mesh from 50 to 100m long are usually set by boat, and left all night or day in deeper areas. Species targeted are mainly pelagic such as jacks.

Larger mesh size set nets (4-7 inches), also on average of 50-150 m in length, and 20m in depth are set all night in deeper waters by 4 to 6 fishers in. Target species are mainly larger pelagic including sharks. 4" mesh size nets are commonly referred to '*Mlimba*' nets in the Marine Park in relation to one of the main target species: mullet.

Active gear ('*juya*', Beach seine ('*kokoro/kavogo*', and *'tandilo')*

Beach seines are very small mesh size (some 0.5 inch) nets. Fishers based on a beach spread the seine over a large area encircling a group of fish, while the two extreme ends of the net are held by two groups of fishers who pull the net to the beach. These nets are non-discriminatory and mainly catch small fry, and juveniles of demersal and pelagic species as well as larger fish. Several fishers concentrate on releasing the net to prevent it snagging. Boats are usually large dugouts that carry 5-8 fishers each. Beach seines have been banned in the Marine Park but a number of groups still operate. Those whose gear has been confiscated have joined other net crews or use hand lines.

'Tandilo' are usually mosquito nets used by women to fish, by foot close to the shore. Three to six women drag the net parallel to the beach and target small fry ('*dagaa'*). Women sometimes use their '*kanga'* (traditional cloth). They target small fish (small fry and juveniles from other species). This is one of the most widely spread gear in the Marine Park.

Women using 'Tandilo' (by M. Samoilys)

'dagaa' drying (by D. Malleret)

'*Juya'*: These are used as a seine, in shallow or deeper waters when a shoal of fish is spotted. Fishers encircle the net around fish, scraping the bottom if in shallow areas. A number of fishers snorkel around the net to ensure it does not snag on coral, and to guide the net around the fish. The net is then pulled closed at the bottom and the catch hauled onboard. The mesh size may be small (1-1.5") or larger (3").

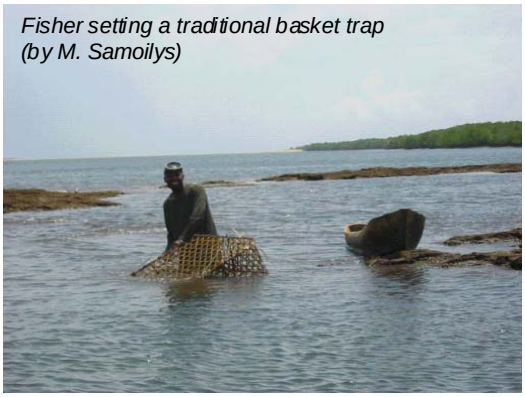
→ Traps

Fence traps, traditional traps: These are not widely used in the selected villages. Fence traps (tidal weirs) can be fixed larger structures or light removable ones. Harvesting occurs at low tide when fish are trapped at the end of the fence. The larger structures are made of large poles and target demersal fish

or prawns depending on the location. These are joined together using a synthetic or palm and bark rope.

Traditional traps are hexagonal woven baskets left overnight and target demersal fish mainly.

Traditional basket trap (by M. Samoilys)



Fisher setting a traditional basket trap (by M. Samoilys)

→ Spears and sticks

Spear, sticks, spear guns: These are home made. Divers use sticks or their hands to catch lobsters, octopus, sea cucumber and reef fish. Sticks are also used on shore, in the mangrove areas to catch crabs. Spear guns are mostly used in Msimbati and Mngoji. Scuba diving for sea cucumber has been reported but is banned in the Marine Park.

→ Lines

Handlines: hand lines are very common and fishers often use them as well as nets. They are bought. They are mainly used from boats. Handlines are used individually but two or three people share a fishing boat.

Longline: A longline crew operates in the Marine Park, but it is a scarcely used gear. Long lines target large pelagics, particularly sharks. They are set in deeper waters.

Traps, sticks, spears, spearguns and some nets are homemade using bought or local materials. Otherwise, lines and nets are bought. Gear can be partly or fully owned, rented, borrowed or belong to '*Tajiri'*. Table 12 shows the most common types of ownership for each gear.

Table 12: Type of gear ownership (in %)

Gear	Rented /borrow	Part owned	Fully owned
Speargun	0	0	100
Handline	8.2	14.8	77
Trap	0	7.7	92.3
Tidal weir	0	50	50
Large nets	33.3	35.9	30.8
Medium nets	10	20	70
Small nets	7.7	30.8	61.5
'Juya'	0	80	20
Beach Seine	0	100	0
'Tandilo'	8.6	60.3	31
Longline	0	50	50

(Source: Household survey)
- Small nets: 1-1.5" mesh size
- Med (medium) nets: 2-2.5" mesh size
- Large nets: > 3" mesh size

As shown in Table 12, the majority of fishers own fully their spearguns, handlines, traps, medium and small nets. The majority of *'tandilo'*, beach seines, and *'juya'* are owned by groups of fishers. Large nets are rented (to '*tajiri'* usually), owned fully or partly.

4.2.2.2 Gear use in proportion of fishers

Out of the 643 households surveyed, 185 were involved in fishing, and represented 456 fishers. Overall, handline (except in Msimbati) and *'tandilo'* are the most commonly used gears in seafront and mangrove villages. The percentage of fishers using *'tandilo'* varies between 18 and 29%. Handline is the most common gear in Litembe (67% of the fishers), Mngoji (44%) and Tangazo (32%). In Msimbati, large and medium size mesh nets are the most widely used gear (respectively by 27% and 19% of the fishers) along with *'tandilo'*. This is illustrated by Figure 9.

As shown in Figure 10, handlines (28% of fishers), *'tandilo'* (23%), larger mesh size nets which over 3" and particularly Mlimba nets 4" (18%) and medium (2" to 2.5") size mesh nets (10.5%) involve the largest proportion of fishers in the surveyed sea front villages. In Mangrove villages, handlines dominate (more than 50% of fishers), then *'tandilo'* (25%). Small and medium nets come third (including *'juya'* and beach seines) with from seven to 15% fishers in Litembe and Tangazo.

In Mahurunga, 50% of the fishers from the five marine fishing households use nets (medium and small meshed).

Few tidal weirs fishers were detected in the survey and those were located in Msimbati. Richmond (pers. comm.) observed 15 tidal weirs between Msimbati and Mngoji area. Tidal weirs are not widely used in the mangrove villages and no tidal weir fishers were sampled.

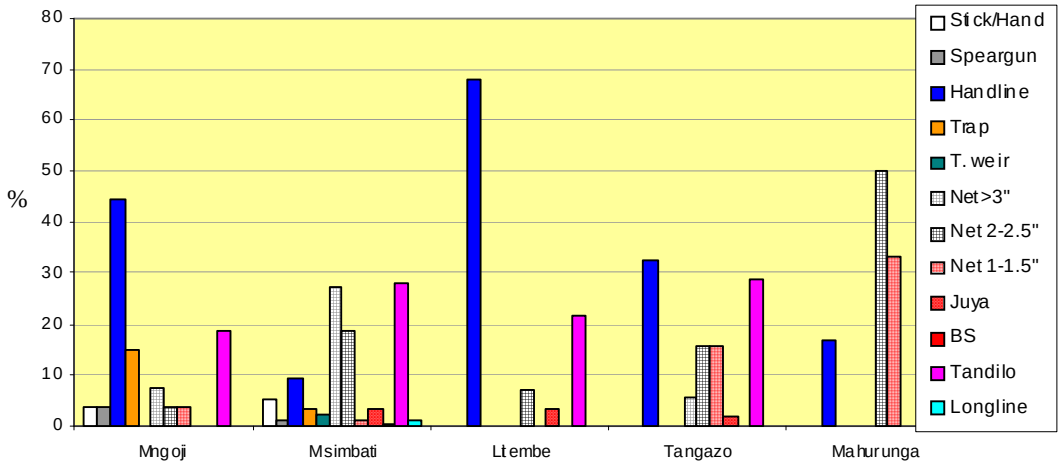
15% of the fishers surveyed in Mngoji used traps and less than 3% in Msimbati. None of the surveyed fishers used traps in mangrove villages, however these are used by a few fishers in mangrove villages (see picture) as was mentioned in the focus groups. A similar situation was found for tidal weirs these are used in the mangrove areas, however by a few fishers. Trap fishing was mentioned in Mitambo and Kilambo focus group discussions.

Hand/sticks are mostly used to collect sea cucumbers and catch octopus. This is carried out mainly in the seafront villages but by less than 5% of the fishers (with a higher percentage of fishers involved in

Msimbati). Finally compared to other locations of the East African coast (Malleret King *et al*., 2003), the use of spear gun is not common in the Marine Park. Spear guns are used in Msimbati and Mngoji by less that 5% of the fishers.

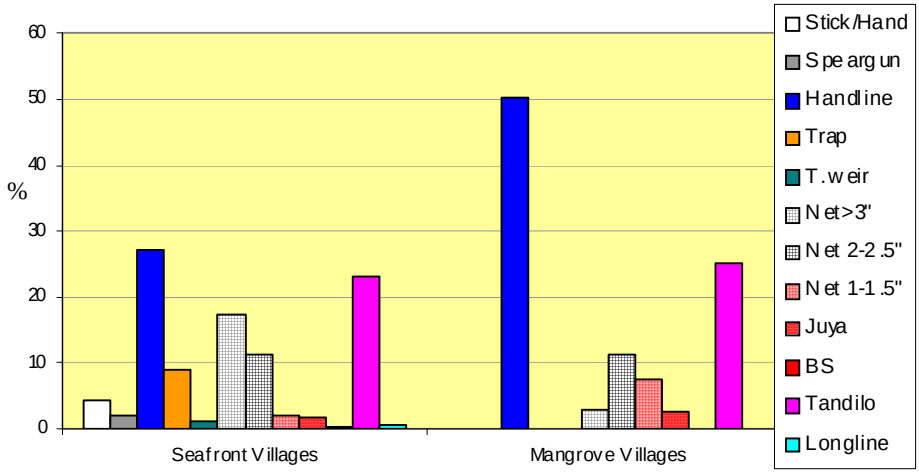
The distribution of gear is illustrated in Figure 9. Figure 10 shows the distribution aggregated at area levels (mangrove and seafront surveyed villages).

Figure 9: Gear use in % of fishers from surveyed households grouped per village
(Source: Household survey)



Note: the distribution of gear does not add to 100% as fishers often use more than one gear.

Figure 10: Gear use in % of fishers from household surveyed grouped into areas
(Source: Household survey)



A wider spectrum of gear is used in the seafront villages than in mangrove villages. *'Tandilo'* are used by a significant proportion of fishers in both areas, and handlines are widely used in both areas but with a much higher percentage in seafront villages. Fishers may use different types of nets; however, they often specialize in one gear.

4.2.2.3 Timing, location and species targeted per gear

Fishing activities vary according to daily and monthly tidal patterns as well as according to seasonal patterns.

Three significant seasons were identified by interviewed fishers:

- '*kusi*' dominated by Southeast Monsoon (SEM) winds, from May to October
- '*kaskazi*' dominated by Northeast Monsoon (NEM) winds from November to March
- *'matalai'* (MAT) which fishers identify as the time between monsoons when there is little wind, March April, October, November. This was had not been picked up in other studies (Guard, 2002; Malleret King, 2003).

Fishing in the Marine Park is usually done once or twice a day, and up to three times depending on tides, season and gear. Fishers spend 4 to 8 hours at sea. Table 13 summarises the main findings from the focus groups discussion on the daily, monthly and seasonal patterns of fishing according to gear. The main species caught and the type of areas fished is indicated for each gear. Small to large fish species are listed before the very small fish (*'dagaa'*).

Table 13: Timing, location and main species caught

Gear	Daily pattern	Monthly patterns and seasonality	Main species *	Areas
Nets (2.5-7")	-Day and Night -Going at low tide and coming back high tide -6-7 hours at sea	Done: all year Peak season: NEM, MAT	Grunters Pursemouth Jacks Mullet Tuna Red Snapper Groupers King fish Milkfish Shark Wolf herring	Around islands Deeper waters Channels between reefs Outer reefs
Nets (less than 2.5")	-Day and Night	Done: all year Peak season: NEM MAT	Mackerels Prawns Small mullets Half beaks Emperor ***'dagaa'***: Sardines	
'Juya'	-Day	Done: all year Peak season: NEM	Small barracuda Emperor Half beaks Mackerel ***'dagaa'***: Sardines	Reefs, deeper waters, around islands (Mozambique)
'Tandilo'	-Day, evening, and night (full moon particularly) -May be done twice in a day -Done at low or high tide depending on the area - 2 to 4 hours spent.	Best: spring tide Done: all year Peak season: NEM (also best to dry fish)	***'dagaa'*:** Anchovy Small herrings Sardines Senda Silver silago	Intertidal, sandy. Islands (Bahasha, Litokoto) River channels (Kilambo)
Beach seine	-Mainly Day	Best: Spring tide	Emperor	Intertidal, muddy

(few)	-Low tide -May be done twice	Done: all year Peak:	Jacks ***'dagaa'***: Anchovies Herrings Synodontis? Sardines (Jan-Aug)	or, sandy mainly. (*Fishers from Mkubiru go to Mafia*)
Handline	-Day and/or night- day -High or low tide depending on areas -Once or twice a day 5 to 7 hours	Done: all year Peak season: NEM, MAT	Mullet Jacks Snappers Pursemouth Grunter Shark	Reef, Sand, Seagrass, channels, Deep, shallow..
Traps (few) (mainly in Mkubiru Mngoji Mitambo Kilambo)	-Day (difficult in windy days) -Low tide -Once or twice depending on tide	Done: all year Peak season: NEM	Emperor Parrot fish Goat fish Rabbit fish Catfish (E) Small tilapia (E) Prawns (E)	Kilambo: done in the Estuary mainly (different species caught) Sea grass areas Channels in mangroves
Tidal weir (few mainly Kilambo, Msimbati)	-Day -Low tide check -Once or twice depending on tides	Best: Springs Done: mainly SEM (prawn season)	Prawns Demersal fish	Along river estuaries Around islands Intertidal areas.
Spear gun (Msimbati)	-Day time -Low tide	Done: all year Peak season: MAT	Jacks Grouper Squirrel Fish	Reef, sandy areas and sea grass
Spear, Hand, diving (Sea cucumbers)	-Day and night (with pressure lamps) -Not every day -Low tide for hand collection -Any tide for diving	Done: mainly in SEM No diving: when river high (muddy waters in Mkubiru)	*Holothuria scabra* *Actynopyga mauritiania* *Thelenota.* *Ananas* *Thelenota. Anax* '*Vipara'* '*Limbo'*	Sand, reef areas, not too deep.
Spear, Hand (Octopus)	-Day or night -Low tide	Mostly: Spring tides Done: All year round		Reefs, rocky areas

(Source: Focus group discussions)
NEM: Northeast monsoon
SEM: Southeast monsoon
MAT: Calm period in between monsoons.
E: Estuary
**NB Species' common names need further checking. Names were collected in Swahili and Makonde, Mr Mwaisaka (Marine Park ranger) undertook a first translation in English however further cross checking should be done on the basis of the fisheries assessment being carried out for the Marine Park/Project under a separate on-going consultancy. The temporary list of fish names is presented in Appendix 10.*

Fishing is done day and night (with or without pressure lamps) depending on the tide. Most fishing is done all year round with some seasonal preferences. The calmer Northeast monsoon is often preferred by Marine Park fishers, it is less cold and sea conditions are calmer than in the Southeast Monsoon. This is found along the Tanzanian and Kenyan coast (McClanahan, 1988; Obura, 2001; King, 2000; Malleret King *et al*., 2003; Shao *et al*., 2003).

In contrast, sea cucumber fishers perceive their catch to be higher during the Southeast Monsoon, the catch increase is also perceived by agents buying sea cucumbers. This pattern also confirms findings of TRAFFIC (2001).

Fishing is mostly done at low tide and spring tides are often considered as the best tide. Octopus collection is done during spring tides, very few fishers go to catch octopus during other tides. This confirms Guard's (2002) results and was further confirmed by an exporter based in Mtwara.

It takes fishers on average ½ hour to 2 hours to get to their fishing grounds (whether they are walking, sailing or poling). For a few months a year some fishers set camp on islands (e.g: Namponda, Bahasha, Litokoto) to access further, more productive fishing grounds. *'Tandilo'* fisher women from Tangazo and Litembe also set camp in Bahasha or Litokoto for a few months of the year. Temporary fishing camps in Namponda, Bahasha and Litokoto have become permanent camps and fishers live with their families on the islands despite the lack of basic services and facilities such as fresh water.

Interviews suggest that for most gear a wide variety of species area caught. The diversity of the catch appears to be higher than in southern Kenya for example where few species dominated the catch (King, 2000; Malleret King, 2000; Obura, 2001).

4.2.3 Gear preference

Fishers were asked to rank the gears in order of preference and explain their choice. Table 14 shows how these were ranked by the focus groups. *'Tandilo'* is not included in this table, being operated mainly by women, fishermen did not feel it appropriate to consider, and vice et versa, women felt that *'tandilo'* was the only gear available to them (except for handlines).

Table 14: Gear preference (results of the matrix ranking)

Gear	Groups Interviewed																		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**Median**
Nets	1	2		2		2	3	1	1	1	1	2	3	1		1			1
Beach seine	2	3	1	4		1							4		2				2
Handline	3	3	2	1		3	4	2		2	4		5	2		2		4	3
Trap							4	3		2			5	4				5	4
Tidal weir							2		2	4			5					3	3
Shark net							1				3		2		3			2	2
Spear gun									5										5
'juya'																		1	1
Longline									4					3					3.5

The choice of gear was found to be determined by skill (knowledge), age (physical demands of the gear), catch and income expected, personal preference for group or individual fishing as well as traditions (e.g., gears are gender specific). Nets were generally the preferred gear, traps and spear gun came out as least preferred.

Despite preferences, gear choice is often determined by cost. This has been found in other studies in East Africa where the price of the gear and the need for other capital items to operate it was an important factor in the choice of the gear (Rubens, 1996; Malleret King, 2000). Table 15 shows the characteristics of the users per gear, the costs involved (as obtained through the focus groups), and the estimated catch.

Table 15: Main users, estimated numbers, cost in USD of gear and average daily catch

Gear	Gender, Age and Origin of users	Cost of gear in USD*	Further equipment needed and cost	Average daily catch per fisher
Set Nets	Men Middle age and Young Marine Park villagers (*Outsiders to the Marine Park in Msimbati*) N= 350 Park villagers	<2": 5-10 3"<>5: 50-100 >5": 80-150	Some nets are set by foot, Usually: boats Dug out: 10-150 *'dau'*: 300-700 Fins, masks for *'juya'* (*In Msimbati, most net fishers are employed by 'tajiri'*)	8-20 Kg Higher: Kilambo Lower : Mngoji
'Tandilo'	Women All ages Marine Park villagers N= > 500	2 or 3 mosquito nets sown together: 12 to 14 USD	None	2-10 Kg 0.5 to 1.5 buckets Higher: Msimbati Lower : Mitambo
Beach Seine	Men Young and Middle age Villagers N= 40	300 USD	Dug out: 60-150	10-30 Kg
Handline	Men (*woman in Msimbati*) Young and Middle age Marine Park villagers (*Outsiders in Msimbati*) N= 200	From 60cts-1 to 6 USD	Renting: 0.2-0.3 per day Dug out from 15-60	High variation 8-30 Kg Higher: Madimba Lower : Mkubiru
Traps	Men Middle Age and Old Marine Park villagers N= 30	70cts-3 USD (depending on size) Last 3 months 2-12 per year Home made	Dug out: 70-150	2-15 Kg Higher: Mngoji Lower: Madimba
Tidal weir	Men Middle Age and Old Marine Park villagers N= 15	Home made	None	3-9 Kg
Spear gun	Men Young and Middle Age Marine Park villagers N= 40	5 USD (Home made)	Fins, Masks	15-20 Fish
Spear, Hand, diving (Sea cucumbers)	Men (diving) Men and women (foot) All ages (foot) Young and middle age (diving) [N= 80]*		*'dau'*: 500-700 Dug out: 10-100 Fins, masks	1 kg
Spear, Hand (Octopus)	Men (diving) Women (gleaning) Marine Park villagers [N= 80]*		Dug out: 10-150	

- The price of the hand line depends on the weight of the line and on the number of hooks.
- The price of the nets depends on the size and the weight of the material used.
- The price of boats varies according to the size, quality and type of boats.

* Spear, hand, diving for octopus or sea cucumber was not separated in terms of numbers.

Net are the preferred gears, but also the most expensive. One way to enter the net fishery without great investments is to join a '*tajiri'* crew, which is what *'juya'* fishers do. The remuneration will not be as high however as '*tajiri'* may take a high percentage of the catch. Fishers can also join other fishers to buy the nets (usually 5 or 6 fishers pool their resources together).

The catch is divided between the fishers, captain and the gear (which is considered equal to a person). The gear/boat owner gets 3 shares of the catch one for the gear, one for the boat and one for his subsistence the other shares go to the rest of the fishers. For *'tandilo'* fisherwomen, the share arrangement was found to be different. 3-6 women may fish together, the gear owner or owners get 50% of the catch and the rest is divided equally among the other fishers.

Similar arrangements are made when two or three fishers fish on a boat owned by one of them.

Boats are needed for most of the gear, particularly nets. Boat prices vary according to the type and size of the boats. As shown in table 16 boats represent an important part of the investment required to fish. The prices vary from 10 USD for a small dug out made of lesser quality wood to 700 USD for a larger *'dau'* and to even 1700-2000 USD for a boat with an engine. Boats are sometimes rented on a daily basis, but then access to the boat is not guaranteed, it depends on the demand from other fishers.

The cheaper methods of fishing are gleaning, using sticks, spear guns and traps or joining crews (nets and *'tandilo'*).

Fishing in the Marine Park is mainly done by Marine Park villagers, however outside fishers also come to operate in the Marine Park. For example, Msimbati focus groups mentioned that hand line and net fishers from Ngao, Naumbu, Mtwara and *'juya'* crews from Mtwara and Mikindani fish in the Msimbati area. Marine Park fishers (including *'tandilo'* fishers) are also highly mobile and fish in different areas in the Marine Park. For example, Mitambo and Madimba fisher women mentioned the fact that fisher women from Mngoji, Litembe and Tangazo fish in their areas. A number of Marine Park fishers (particularly from Mkubiru) join crews in Mafia and Kilwa on a seasonal basis, and other fishers fish in Mozambique waters (sea cucumber, octopus, nets fishers, and handline fishers). This is illustrated in Map 3.

Gears that are more physically demanding (hauling large weights, swimming or diving) are usually used by young and middle aged men. Elder fishers use traps and tidal weirs mainly. Women fish with *'tandilo'*, but also glean for sea cucumbers, and octopus at low tide.

The total number of fishers estimated from focus groups' discussion could be up to 1100 people. This does not take into consideration people using several gears, but takes into consideration fishers who fish occasionally. Outsider fishers are not included in this figure.

Consistent catch information was difficult to obtain due to the high daily variability, this information will thus benefit from further detailed investigation from the fisheries assessment and catch data collected by the Marine Park. However, it appears from focus group discussion the largest catch (kg) per fisher comes from beach seine and other nets and handlines and the lowest catch from *'tandilo'*. However, fish and other marine organism prices vary significantly according to size and species which means that income from a high catch (kg) of beach seine (small fry) may be lower than for a lower catch (kg) from handline (pelagic or larger demersal fish). Similarly, the price of sea cucumber is high and thus the daily income on a small catch may be higher than for other gear.

Most focus groups mentioned that the catch varies according to season, the catch being higher in the Northeast Monsoon for most gear. In other areas of East Africa, the catch can vary by 100% (Obura, 2001). The reason for the difference in catch is often found to be the difficulty to access further offshore productive fishing grounds when the sea is rougher (hand lines and nets) during the Southeast Monsoon. The difference in catch between seasons was however not as significant in the Marine Park as it seems to be in other areas. This may be because in southern Kenya for example, the reef is a

barrier reef and fishers need to go through channels that can be dangerous on windy days. This is not the case in the Marine Park area where the reefs are patchy and there is a large protected bay.

The Southeast Monsoon is preferred by sea cucumber fishers and by tidal weir fishers interviewed from the mangrove villages who target prawns that are more available during the rainy season.

Fishers operate individually or in groups. No fishers association or cooperative were found to operate in the Marine Park although an association for fishers in Mtwara region (Mtwara Fishermen Association) has recently been formed and is based in Mtwara. Mtwara Fishermen Association was not mentioned by any of the groups.

4.2.4 Prices of fish and potential income according to gear

Fish prices are highly dynamic and vary according to size, species, seasons, locations and the level of the demand. Prices of sea cucumber, octopus and lobsters are however determined by the agents and exporters and are relatively stable.

Fish is sold in buckets or baskets (particularly very small fish; '*dagaa'*), per piece or per pile/bundle, and very rarely by weight (per Kg). Sea cucumbers may be sold per piece or per Kg, but a price per Kg has been determined. Octopus is sold per Kg. . Table 16 summarises prices that fishers from the Marine Park may get.

Table 16: Fish prices in USD (received by fishers)

Type and size of Fish	**Price per piece**	**Price per Bucket**	**Per Kg wet**	**Per Kg dry**
'dagaa'		2-4		
Small fish	0.1-0.5			1.2-1.5
Medium fish	0.4-1			
Large fish	0.8-10			
Very large fish	10 up to 70			
Octopus			0.25-0.5	
Squid			0.5-0.9	
Prawns			1.8-2	
Lobster			4	
Sea cucumber**				
Actynopyga mauritiania			4.5	17
Holthuria scabra			3.5	16
Thelenota anax	0.8			10
Thelenota ananas				8
,'*Jongo uzi'*	0.2-0.25			3

(Source: Focus group, key informants)
Very small fish: *'dagaa'*
Small fish: a hand length
Medium fish: half an arm length
Large: an arm length
Very large: usually large pelagics above 10 Kg
* Prices were obtained from the exporters who mentioned that lobsters were brought mainly by local fishers in small quantities.
** Sea cucumber prices vary according to the species (the size of the species). The larger, the higher the price.

It was found, when investigating fishers' prices in larger markets such as Mtwara, that these can be twice as high as in the Marine Park. Similarly, prices in Mozambique were estimated by fish traders to

be half of those in the Marine Park. Prices are also affected by the seasons, for example a bucket of *'dagaa'* can be sold 3000-4000 TSh (3-4 USD) during the dry season and the price may drop by half during the rains (demand may be lower in the rains due to the difficulty to dry the fish). Thus, Table 16 can only represent a snap shot of indicative prices.

Sea cucumber prices were obtained mainly for dried sea cucumbers. Sea cucumbers are usually dried by the fishers themselves unless they collect very few and then they sell them wet. Traders dry them. Very rarely does the agent dry them him/herself. As shown in Table 16 however, agents have determined a price according to the species and size of the individuals in the species. Fishers can sell direct to the agents and then the price obtained is higher, however traders are the ones who commonly deal with the agents in Mtwara.

Fishers were also asked to estimate their average daily income from fishing. Findings are summarized in table 17. Catch and price information were also used to complement the information gathered from the group discussions.

Table 17: Daily income estimation

Gear	**Estimated income per day fishing. TSh and (USD)**
Nets	1000-10000 (1-10)
'Tandilo'	1000-4000 (1-4)
Beach seine	2000-3000 (2-3)
Handline	500-4000 (0.5-4) mostly 2000-4000 (2-4)
Traps	No consistent information was obtained
Tidal weir	4000-20000 (rare) (2-20)
Spear gun	7000-10000 (7-10)
Spear, Hand, diving (Sea cucumbers)	No average could be obtained. The income can vary from 200 to 16 000 (0.2 to 16)*

(Source: Focus groups)
*The income of sea cucumber fishers varies highly according to the catch, the species caught and whether they dry or not the sea cucumber themselves.

The daily income per fisher can be as low as 0.5 USD per day if fishing with handline on a bad day to 20 USD on a good day for a tidal weir or 10 USD with nets. However, a majority of fishers' focus groups estimated their daily income to be between 1.5 to 3 USD. The highest catch and income being mentioned by the shark net fishers. This information can only give an indication of the income, and an order of magnitude of this income. An indirect indicator was used (see section 5) to investigate the socio-economic status of Marine Park fishers.

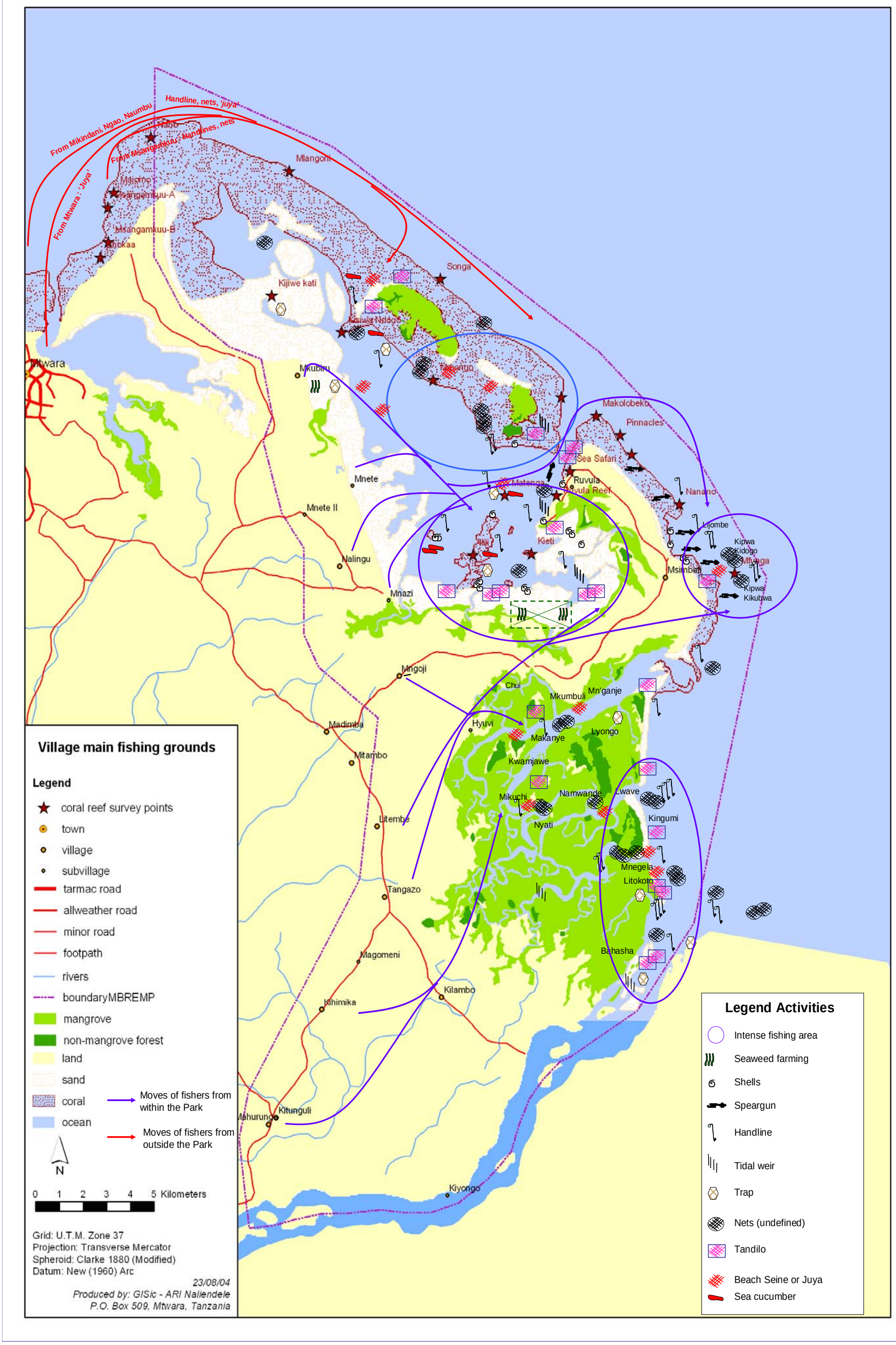
Although difference in income can be explained by the gear used, its potential catch, part of the variation can also be explained by skill (Rubens, 1996). Highly skilled fishers get larger catches than others do.

4.2.5 Fishing grounds

Map 3 below shows the main Marine Park fishing grounds for the different gears as identified and mapped by the fishing groups. Sea front villages and some of the mangrove villages fish around Namponda Island and all mangrove villages fish around Bahasha and Litokoto islands. The three islands represent the most intensely fished areas in the Marine Park as shown in the Map (blue circle).

It also shows that fishers go to Mozambique to fish and for some consider Swavu and Mauga islands in Mozambique as their best fishing grounds (the geographical location of Mozambique fishing grounds was unfortunately not obtained). The circled areas highlight the most used areas that will need attention from the Marine Park and where the pressure on marine resources is likely to be highest. The three areas are Namponda islands, the eastern side of Mnazi Bay, Reefs off Msimbati and Bahasha and Litokoto islands.

Map 3: Marine Park main fishing grounds and fishers' main movements from outside and within the Park.
(Source: Focus groups)



4.2.6 Perceived changes in the last 10 to 20 years

Most fisher groups interviewed have perceived an increase in the number of fishers in the last 10 to 20 years (the increase was estimated to be 60% in Mkubiru for example). Explanation provided for this was the lack of employment opportunities for young people. For example in Mngoji the dramatic increase in *'tandilo'* fisher women, was attributed to the lack of opportunities for women school leavers. Another explanation was the high mobility of fishers and the influx of outside fishers in the Marine Park areas.

The increase in the number of fishers is perceived to be accompanied by a drop in catches and income despite an increase of fish prices. Spear gun fishers estimate their catch to have dropped by half in the last 10 years (from 20 to 10 fish). Some groups explained the drop in catches by the wide use of beach seines as well as by the increase in fishers. Groups mentioned that an increase gear prices has contributed to reduce further fishers' income.

Furthermore, fishers note the need for them to spend longer hours at sea and go further off shore to find the resources. This was mentioned by net fishers, handline fishers and ex beach seine fishers.

Interestingly however a number of fisher groups found that their catch had increased in the last 10 years. These were large nets fishers in Litembe and Kilambo (mangrove villages) who explained this increase by the effective ban on dynamite fishing in the late 1990s.

'Tandilo' fishing groups were divided in their perception of the evolution of the catch in the last 10 to 20 years. More than half perceived the catch to have dropped, but fisher women in Kilambo, Tangazo and Mngoji perceive the catch as having increased (up to 100% increase in Mngoji) despite the increase in the number of fisher women. Some groups have noted a positive difference in the availability of small fish since the number of beach seine crews has been reduced.

Sea cucumber catches are perceived as having dropped in the last 10 years and a change in the abundance of species (the smaller species being more available). Prices are considered to have increased significantly and over compensated the drop in catches. Income has thus increased. This has led to an increase in the number of fishers doing this activity except in Madimba and Mkubiru where the number of sea cucumber fishers has decreased.

The increase in the number of sea cucumber fishers is likely to intensify the pressure on the already declining resource. Sea cucumbers are often collected in Mozambique.

A number of fish species were mentioned as more difficult to find than 10 years ago and these include: *'Kibangi bangi'*, Milkfish, Parrot fish for example as well as '*Fatundu*', '*kapungu'*. Anchovies have been perceived as difficult to get particularly by Mngoji and Mitambo groups whereas it is one of the preferred species and used to be abundant.

One of the main changes in this last year has been the ban on beach seining. Although beach seines still operate in the Marine Park despite its ban, some groups have stopped and converted to handlines, or joined other net fishing groups. The reduction in beach seining is considered to have had a positive impact on the catch of *'tandilo'* fishers.

4.3 Seaweed farming

Seaweed farming is carried out in Mkubiru and Nalingu. It was briefly done Msimbati in 1997/1998 but was discontinued after the harvest was not collected by the buyer.

The activity is done throughout the year by men and women (about 20 people in Mkubiru). It takes about 2 to 2.5 hours per day of work, usually at low tide, with peak work requirements during the harvesting. 10 to 15 Kg of seaweed may be collected in a day during the harvest. Seaweed is harvested mainly during the dry season when drying the product is easiest.

The main buyer is a Zanzibar based company with agents along the coast of Tanzania. The buyer provides farmers with seedlings and ropes necessary to grow the seaweed and comes once or twice a year to collect the production. It takes one month to one and a half months for seedlings to be ready for harvesting, which occurs every two weeks.

Income derived from seaweed farming is relatively low with prices at 140-170 TSh (0.14-0.17 USD) a Kg of dried seaweed. This is consistent with information collected in the Mlingotini, Bagamoyo (Malleret-King *et al*., 2003). No information was obtained on the amount of seaweed sold by individuals.

Nalingu is the main seaweed producer of the Marine Park but no information could be gathered on this activity.

Interest in seaweed farming is declining due to low incomes.

4.4 Shell collecting and trading

Seashells are collected for a number of purposes in the Marine Park. The largest quantity of shells is collected for food (e.g. oysters, small gastropods, cockles etc.). Shells are also collected for ornamental purposes (e.g. helmets, leopard cowries, cowries, pen shells, conch shells, tritons, rock shells etc.), which are sold as curios for tourists along the coast and to markets around the world (Richmond, 2002; TRAFFIC, 2001), and for their operculum which is the cover protecting the gastropod's entrance (e.g. Rock shells, tritons - small or large).

Agents believe that shell opercula are used in the perfume industry; however, few interviewed traders, fishers or agents could confirm the use of opercula. The TRAFFIC (2001) study had similar problems to uncover the use of opercula and suggested that they are used in the perfume industry and in incense production, mainly in India. An internet search revealed that sea shell opercula (including those of *Chicoreus Ramosus)* were traditionally used by Jews and Muslims over millennia to produce incense for religious purposes. Furthermore, an ancient Arab recipes recorded in a medical book of the 1930s shows that *Chicoreus Ramosus* opercula (among others) was an ingredient used in the production of incense for medicinal purposes, especially for curing stomach and liver ailments. Little is known as to whether these recipes are still in use. A more recent study suggests that opercula based incense is part of traditional hospitality in Oman; at the end of a meal, guests are offered a range of perfume and incense, some of which are opercula based. Finally, Turbo shell opercula have been and are being used to produce jewellery (pendants, earrings in Asia and Europe), and in religious practices in India (small turbo shell opercula are sold as 'Disc of the moon' to pilgrims) (Mienis).

Bivalves collected for food are also used to produce lime for household use or local level use.

4.4.1 Use patterns and users

Shells collected mainly for food are harvested at low spring tides in intertidal areas, by women and children who glean for them. Larger ornamental shells are collected in deeper waters, on reefs or sandy patches where men dive for them. Opercula come from both food and ornamental shells. Shells are usually collected and traded by the same individuals at the local level. Ornamental shells and opercula are then sold to agents and exporters in Mtwara.

Although the shells harvested by women are collected for home consumption, surplus is sold in the village. Shell meat is taken out, cleaned and usually boiled. It is then sold per spoonful (10-15 pieces of meat in one spoon). Larger shells such as pen shells, tooth pearl shells are usually cut in pieces and boiled or grilled and sold in piles. The meat of larger ornamental shells is usually cut in three or four pieces and sold grilled or boiled at the village level while the shell is traded.

Table 18 summarises the daily and monthly patterns of shell collection, species targeted and areas where these are collected. Table 19 concentrates on the type of users, the selling patterns and processing of these shells.

Table 18: Resource use patterns, species and areas - Shells.

Main use	Daily pattern	Monthly patterns and seasonality	Main species	Areas
Ornamental/ **Operculum**	Day and Night (pressure lamps)	Done: mainly in SEM (except in Litembe where SEM is peak farming time).	Giant Tritons (op.) Helmet shells (horned, grey bonnet, and Bull Mouth) *Chicoreus Ramosus* (op.) Leopard cowries Coral shells Harp shells Spider Conches Cone shells Giant Clams Black lip pearl oyster	Marine Park intertidal areas, reefs Mozambique (Tangazo)
Food **Operculum**	Day and night but mainly day	Done: All year during spring tides	Rock shells (including *Chicoreus Ramosus*) Clams Smaller conch shells '*Ngovu*' Frog shells Pen shells, oyster, tooth pearl shells (F,L) Cockles and false cockles (F,L) Screw shells	Marine Park intertidal areas

L: Lime
F: Food
Op: Operculum
SEM: Southeast Monsoon

Seasonality was confirmed by the agents consulted, who found that they were getting more shells (ornamental) during the Southeast Monsoon and Opercula at the end of the Southeast Monsoon and during the whole of the Northeast Monsoon. However, the best season (according to agents) for

opercula was found to be September to December. Shell collection and trading is rarely a full time activity, often ornamental shells are also collected by fishers fishing for sea cucumbers.

According to the focus groups estimation, the total of shell fishers in the Park would be approximately 320.

Table 19: Resource users, selling patters, processing – Shells.

Shell type	Main Users	Selling	Processing
Ornamental	Men Young Middle age Marine Park villages	Local traders (few), Agents and exporters in Mtwara town Traders from Mtwara who go to Msimbati and Mngoji.	Shells are dried or kept or buried for 4 or 5 days until it is cleaned. For some, meat is eaten roasted or grilled.
Food/Lime	Women Young and Middle age	Home consumption Village	Cleaned and boiled or grilled.

Shells (ornamental) and opercula are sold, ready for export, in Mtwara to agents/exporters often from local traders or directly from fishers. Mtwara agents are mainly from Zanzibar, Pemba or Dar es Salaam. Curio shells are then sold to hotels in Tanzania or Kenya. Findings from discussions with agents in Mtwara showed that ornamental shells are sold in Dar es Salaam and Zanzibar to Chinese exporters, or hotels. Shells exported include cowries. It was also found from agents that some opercula were exported to or via Dubai.

Shell prices vary according to the species and seasons and thus prices given in Table 21 can only be considered as indicative. Prices are given per Kg or per shell in the case of large ornamental shells. Opercula are graded into small and large and are dried before weighing. This information was collected through the focus group discussions and complemented by key informant interviews. Fishers' perception of price changes in shells is also summarised in Table 20.

Table 20: Ornamental Shell and opercula prices (fishers, local traders, and export prices when available), the use and the changes in the recent years

Price of Shell and opercula	Price obtained by fishers, local traders in USD	Agent selling prices in USD (Agent)	Agent selling location	Change in prices
Opercula - Large - Small	 13-18/Kg 5-8/Kg	 26-33/Kg 15-18/Kg	Dubai. Exported by the agent directly.	Increase in places Decrease in places (Msimbati)
Triton	0.4-0.8/Kg	20/Kg	Sold in Dar es Salaam to Indian exporter	Decrease
Cowries - Small white - Small yellow - Leopard cowrie	 0.1-0.15/Kg 0.2-0.25/Kg 0.15-0.2/Kg	 0.35/Kg 0.35/Kg	 Sold in Dar es Salaam to Chinese exporter	
Hofu	2.5-4 ppu			Increase
Helmets - Larger Horned or Bull Mouth - Smaller (Grey Bonnet, other small helmets)	 1.5-2 ppu 0.8-1/Kg			Increase

(Source: Focus groups, interviews with agents)
/Kg: price per Kilogramme
ppu: price per unit

Information on average catches are difficult to obtain as it seems that shell collecting is often an opportunistic activity. It is done along with fishing for octopus or sea cucumbers for example. Groups mentioned that 5 to 20 shells could be collected per day out, depending on the species (1-20 USD plus the meat price). However, as mentioned previously, shells are not collected everyday and are an opportunistic activity. This was found by in other parts of Tanzania (Anderson and Ngazy, 1998; TRAFFIC, 2001).

Furthermore, in a season, it was estimated by focus groups that on average 10 Kg of opercula are gathered per season per fisher (on average 5 months) which amounts to 130-200 USD per fisher per year.

An agent interviewed in Mtwara mentioned the fact that most of the opercula and shell traded came from Mozambique. Msimbati was considered as one of the main shell collecting areas in the Marine Park. Quantities exported by one trader in Mtwara were found to be on average 200-300 Kg of opercula per month and 500 to 1000 Kg of cowries in a similar amount of time. The trader interviewed appeared to be a small size operation, these figures potentially need to be multiplied by 10 (ten agents in Mtwara) to obtain an indication of the amount of shell products exported from Mtwara (including Mozambique waters). However, according to TRAFFIC (2001) agents/exporters specialize in certain shell species.

4.4.2 Perceived changes in shell resources

There was a consensus in all villages on the fact that larger ornamental shells are rarer now than they were before (particularly Giant Tritons and Helmet shells). The necessity to go further and deeper to find

these shells was noted. A decline in the size of the ornamental shell found in the Marine Park was also mentioned. This information suggests that these resources are under high pressure. Some groups have even stopped going to Mozambique to collect shells because it is not worth their while anymore. A drop in ornamental shells availability (in the Marine Park and in Mozambique) was also mentioned by Mtwara agents.

Fishers perceive the beach seines as having had a negative impact on shell stocks. The number of traders/collectors of ornamental shells is said to have decreased, due to the drop in prices, which was noted in all villages except in Madimba. This has contributed to the fact that income for shell collectors has dropped but not in proportion to the reducing resource base.

In contrast, it seems that the opercula trade is booming. Prices have increased according to traders/collectors. In Mngoji, the group estimated that the catch per fisher had doubled in the last 10 years. According to the fishers, the increased availability of opercula comes from the fact that the number of *Chicoreus Ramosus* shell have increased, due to a high reproductive rate. Similarly, agents have confirmed that the trade in opercula is acknowledging a boom and that the quantities traded have increased significantly in the last 5 years. The increased availability of *Chicoreus Ramosus* may be due to the depletion of competitors (other widely used shells) or predators, this would need investigating further. The increased catch could also be the result of an increase in the demand in recent years, thus although shell opercula were exploited 10 years ago, other shells were preferred by fishers who now focus on *Chicoreus Ramosus*.

Less information was obtained from food shell collectors, particularly on changes. Indicative shell meat prices are summarized in table 21 below.

Table 21: Price of shell meat in USD

Price of Shell Meat	Per spoon	Pile (1/4 Kg)*	Per piece
Small gastropods (small conch shells, worm shells, small cowries etc.)	0.02-0.03		
Larger gastropods and bivalves (maybe for ornament) – pen shells, Cone shells, larger cowries, clams, Triton shells, coral shells, cockles etc.		0.8	
Large gastropods (generally for ornament) – Helmet, triton shells, large clams, conch shells.			0.1-0.15

(Source: Focus group discussions and key informant interviews)
*Extrapolated on the basis of 1/4 Kg (250 g) piles

2 to 5 litre cooking pans (‘*sufuria’*), or 10 to 20 litre buckets of shells are collected per woman. No information was obtained on changes in recent years on the shells used for food. In Mngoji, the group has perceived a slight increase in the availability of oysters. In Mkubiru, collectors have perceived an increase in the number of people involved in collecting shells for food. The reason for this is believed to be the lack of employment opportunity.

The number of food shell collectors did not come out as high in the household survey as in focus group discussion (hundreds of women involved mentioned in the focus groups for Mngoji, Litembe, Msimbati)

in or in the occupational structure study (16% of households involved in shell collection in Madimba, 22% in Mngoji, 10% in Msimbati).

The reason for this may be that this activity is partly opportunistic and ornamental shell collecting is declining. Households may not depend on it sufficiently to consider it as a livelihood activity. However, large quantities of shells are collected by hundreds of women and children, this was also observed by Richmond *et al*. (2004). Increased knowledge on the status of the resources is needed because it is clearly an important contributor to household food security for a relatively large number of Marine Park households.

4.5 Trading of fish, cephalopods, crustaceans and holothurians

Trading marine products is an important activity in the Marine Park, it involves a large number of households. This emerged from the occupational structure study (15% of household involved overall for marine associated villages), particularly in Msimbati and this was confirmed by the focus group discussions.

The Marine Park marine products are traded both inside and outside the Marine Park and some are exported, most products are bought in Marine Park villages but some are also bought in Mozambique (especially dried fish – '*ngonda'*, or fish to dry). At the same time, a number of outside traders come to buy products in Marine Park villages. Table 22 summarises the characteristics of the main traders in Marine Park fishing villages. Maps 4 and 5 illustrate sea cucumbers and other products movements in the Marine Park area.

Table 22: Marine products trade - resource users, selling, buying and timing

Patterns/Product	**Sea cucumbers**	**Fresh fish and Fresh *'dagaa'***	**Dried fish and Dried *'dagaa'***	**Octopus, Squid Prawns, Lobster**
Users (gender)	Men	Men Women	Women Men	Men
Buying location	Marine Park fishers Mozambique	Marine Park fishers	Marine Park fishers Mozambique	Marine Park fishers Mozambique (if advance by middlemen)
Selling	Agents in: Msimbati Mkubiru Tangazo Mtwara	Local market Mtwara Outside traders	Local market Mtwara Other Districts (inland) Outside traders	Traders and Agents for Mtwara exporters. Msangamkuu Msemo Beach Namponda Local market
Best time		NEM (more fish) Cashew season (higher demand) Rice harvest (higher demand)	NEM more fish Dry season- easier to dry Cashew season (higher demand) Rice harvest (higher demand)	Spring tides MAT
Transport	In sacks Bicycles	Bicycle (baskets) Boat	Depending on location: Foot, bicycles, public transport (in sacks)	Hire Cars Motorbikes Bicycles (ice box for octopus provided by exporters) Exporter truck Sacks
Processing	Boiled and	None.	Sun dried	None

	dried	If surplus then gutted and dried, smoked, salted Fried	Hot smoked Salted Cut in pieces if large fish	Octopus may be cleaned, cut and boiled for local market.

(Source: Focus group discussions, key informant interviews)
NEM: Northeast Monsoon
SEM: Southeast Monsoon
MAT: Matalai

Trading is an important economic activity for all villages. Based on the focus groups' discussions it was calculated that there could be up to 110 fresh fish and dried fish traders in the Park (a majority of fresh fish traders) nearly half of whom would be located in Msimbati. To this, 35 sea cucumber traders should be added and 25 octopus traders. Marine products are generally bought by local or outside traders directly from fishers, at landing sites. Traders also buy sea cucumber, dried fish, octopus, prawns or lobsters in Mozambique.

Sea cucumbers are sold to agents located in the Marine Park (Chinese exporters base themselves in the Marine Park for a few months to buy sea cucumber directly) or in Mtwara. Agents in Mtwara originate from other parts of Tanzania (e.g. Dar es Salaam, Zanzibar). Sea cucumbers are not consumed locally and are generally exported to Asia where they are a high value product. There are 3 sea cucumber agents in Mtwara. These agents buy sea cucumbers to Marine Park traders as well as other local traders for dealers/exporters in Dar es Salaam (mainly Chinese). According to agents, most of the sea cucumbers exported from Mtwara are caught in Mozambique (this was also found by TRAFFIC, 2001).


Fresh sea cucumbers (by E. Mottier)


Dried sea cucumbers (by D. Malleret)

Octopus, squid, lobsters: The few lobsters that are caught (whether in the Marine Park or in Mozambique) are sold to traders in Msangamkuu (part of which is included in the Marine Park) who sell them to the exporter based in Mtwara. Lobsters can be sold live or dead. They reach a better price if sold live. Squid are sold on the local market (village level), or in Mtwara. A small proportion is sold to the exporter in Mtwara. Octopus is one of the larger export products. Marine Park octopus are sold to Marine Park traders where and are collected every few days in Msimbati by trucks and Namponda by the exporter by boats. Traders are provided with ice boxes to store the octopus. The octopus may have been fished in the Marine Park or in Mozambique waters. Lobsters, squid and octopus are then sent to Dar es Salaam where they are processed and exported (frozen) outside Tanzania. One exporter operates in Mtwara and another exporter has started to buy octopus in Northern Mozambique and has provided boats, engines, and iceboxes to agents.

Prawns, Crabs: Prawns and crab are bought from Marine Park fishers, and sold on the local market, in Mtwara or around Mtwara. They are also bought by outside traders (e.g. from inland or other coastal towns such as Masasi, Kilwa, Newala, Tandahimba as well as from Mtwara).

Fresh fish and fresh *'dagaa'* are sold in local markets as well as in Mtwara town market. It is also sold to outside traders who transport it to places such as Newala or Masasi. The surplus of fresh fish is dried, smoked, salted or fried. A large proportion of the *'dagaa'* is dried rapidly or fried. Traders usually transport their fish by bicycles in sacks or baskets.

Fresh fish and shark at Mtwara market (by D. Malleret)

Dried fish (smoked, salted, sun dried) is an important trade and appears as a most profitable one. Fish is bought dry or wet from Marine Park fishers or dried from Mozambique fishers whose prices, according to traders, are much lower. Dried fish is sold on the local market, in Mtwara, and a high proportion is sold to outside traders who come from inland areas as far as Tunduru, Tandahimba, Newala, Mahuta or Nachingwea. Dried fish is also taken to outside markets by Marine Park traders (groups from Msimbati and Kilambo mentioned this). The fish is packed in sacks and transported by bicycle, lorry, or public transport, depending on the selling location.

Sun drying fish (by M. Samoilys)

Hot drying fish (by E. Mottier)

Other products that are traded, but in lesser proportion were not mentioned in the groups but were discovered when interviewing Mtwara marine product agents, were shark fins, and fish swim bladders. Local traders sell these products, dried, to the agent who sends them to Dar es Salaam where they are exported to Asia, mainly China. A proportion of these may come from the Marine Park although it was no specified.

Drying swim bladder (by E. Mottier)

Dried swim bladder (by D. Malleret)

Swim bladders (see pictures) are recently exported from Mtwara. According to the agent, they are used for food, but this was not confirmed.

Dried shark Fins (by D. Malleret)

Ornamental shell – Bull mouth helmet - (by D. Malleret)

Due to the high demand for fisheries products, and the decrease of some products in the Marine Park area (particularly of sea cucumbers and shells), traders and agents mention that a higher proportion of the products traded came from Mozambique.

Trading is done all year round, however most of the traders mentioned that Matalai and beginning of the Northeast Monsoon are the best seasons (higher quantities of fish available and prices higher). One of the reasons for this is that the dry season is best to dry fish and to conserve it. In the rains, fish rots quicker. In addition, the beginning of the Northeast Monsoon coincides with the cashew nut harvest seasons, which is when households purchasing power is highest (in the Marine Park area but also in Mtwara Region as a whole, Masasi, Lindi etc.) thus the demand for fish is highest and prices increase. A similar phenomenon is observed on a smaller scale during the rice harvest (June-August).

There are a high number of fresh fish (including *'dagaa'*) traders, this being the main product traded. Numbers vary according to the time of the year. Men sell fresh fish (not *'dagaa'*) and a large number of women sell fresh and dried *'dagaa'*. The number of women traders increases during the cashew season when demand for fish increases. Table 23 summarises findings on quantities sold, margins and perceived changes by the traders.

Table 23: Marine products - Quantities sold, margins, changes

Products	Quantities	Margins/Income (USD)	Changes
Sea Cucumbers	Traders 10-20 Kg per week in season	Margin*: 20-30% 2 to 8 USD per kg are made (depending on species)	Less sea cucumbers Fishers need to go further and dive Amount traded decreased by 60% between 1980s and 2000s Higher prices Increased income
Fresh fish *'dagaa'*	*'Dagaa'*: 1-4 buckets (20-80 Kg) Fish: 10 to 60 Kg	Margin: 20-60% up to 100% Income: 0.25 to 0.4 per Kg *'dagaa'* Income: 0.3 to 0.6 on other fish	More traders (except Mitambo where demand has decreased) Increase income (except in Msimbati)
Dried fish *'dagaa'*	Highest 80-120 Kg per trip 5-8 sacks per week	Net margin*: 40-100% Per trip: 20-100 USD	More fish More traders
Prawns, Lobsters, Octopus/squid	10-12 kg per day (octopus during Spring tides prawns and few lobsters)	Margin Prawns: 30-80% (0.4-1 USD per Kg) Margin Lobster: 100% (3 USD per Kg) Margin Octopus: 20-30% (0.2 to 0.3 USD per Kg) Margin octopus agents: 50-60%	Smaller prawns, lobsters, octopus Less prawns and Lobster More traders because more dealers' agents.

(Source: Focus group discussions, Key informant interviews)

*Fish may be bought fresh and dried by the trader. The margins mentioned in Table 23 take account of the weight loss. To produce a kg of dried sea cucumber, on average 2 Kg of wet sea cucumber are needed, however this varies according to the species (Agent, pers. Comm.). To produce 1 Kg of dried fish, 2.5 Kg of wet fish was found to be needed. Traders noted that this was not so in Mozambique where fishers add a lot of salt to increase the weight, thus with 2 Kg of wet fish they produce 1 Kg of dried fish.

Amounts traded vary highly according to seasons and according to the buying capacity of the traders. Thus, figures mentioned are only indicative. Agents and exporters were able to provide figures that are more reliable. Figures were usually given per trip (that is 3-5 days) except for fresh products. The bulk of octopus is traded during spring tides.

4.5.1.1 Sea cucumbers

According to sea cucumber traders, the availability of sea cucumbers has dramatically decreased in the Marine Park and quantities traded have decreased by at least 60%. On average, a small sea cucumber trader will sell 10 to 20 kg of sea cucumbers per week to the agents. Depending on the species, the trader will make a profit of 20 to 30% (2 to 8 USD mark up depending on the species). The price at which the agents sell them to exporters was not known. Thus, traders' income (not net) will amount to 20 to 60 USD a week, 3 to 9 USD a day. However, the most common species nowadays are '*vipara'*, smaller sea cucumbers on which the mark-up is more often 2 to 4 USD than 8 USD per Kg. Traders

noticed that smaller sized sea cucumbers are now caught. This was observed by Richmond *et al*. (2004), a similar impression was given by the agents.

Although the agent consulted could not give a precise idea of how much of his sea cucumber came from the Marine Park, according to him a large proportion came from Msimbati. Quantities sent to Dar es Salaam from this one agent only were found to be 1500 Kg for February, March and April only. The rest of the year, 500-700 Kg are sent every 3 to 4 months. Thus, a total of 3000-5000 Kg of sea cucumbers are exported per year by one agent. The export price was not known.

Sea cucumber prices are perceived to have increased significantly. Groups mentioned that some prices had doubled or trebled in the last 10 years particularly for the *Holoturia Scabra* at 20-30 USD per Kg, *Actynopyga Mauritania* at 20-25 USD per Kg and smaller species or individuals at 5-8 per Kg dried. The number of traders has increased in some villages and decreased in others.

According to the sea cucumber trader groups, the price increase has offset the decrease in the quantity of sea cucumbers traded and incomes have increased. This particularly where number of sea cucumber traders has dropped (i.e. Mkubiru and Mitambo).

4.5.1.2 Fish and 'dagaa' (fresh and dried)

Fresh fish and *'dagaa'* traders sell 10-80 Kg of fish per week. Their mark up was found to be about 0.2 to 0.4 USD per kg in general (30-80%) depending on the fish traded and the market targeted. Income was found to vary between 1.3 to 20 USD per day. Traders insisted on the fact that income was highly variable according to fish availability, season, and the capital available for them to buy fish.

The quantity of dried fish traded was found to be 60-120 Kg per week for a trader. On average traders make 20 to 100 USD per trip mostly between 60 and 80 USD depending on the market targeted. Traders get lower prices if their product is sold at the local market. Trips to distant markets are however seasonal and done by Marine Park traders mainly from May to December.

According to the fish and *'dagaa'* traders, the number of traders (except in Mitambo) has increased in the last 10 years, as have the fish and the income. The demand for fish has increased significantly, except in Mitambo, which is the reason why the number of traders has decreased there in recent years.

For traders one of the reasons for the increase in fish available has been the end of dynamite fishing. However the increase in the number of traders, and particularly the increase of outside traders has lead to a situation where local traders have difficulties to get fish despite the availability. Outside traders' purchasing power is often higher than that of the local traders. This influx of outside traders has also contributed to the fish price increase. This was raised as an issue (see section 4.6).

4.5.1.3 Other products traded

On average traders can sell 3-6 kg of prawns, 5-6 kg octopus/squid and very few lobsters per day, if any.

The mark up taken is between 20 and 30% for Octopus (octopus is bought for 0.25-0.35 USD from fishers, sold by traders to agents 0.4-0.8 USD, who then sell the octopus to the exporters for 1.2 USD who processes it). It emerged from discussion with the Mtwara based octopus exporter that about half of the octopus collected by the company in the Mtwara area is bought in the Marine Park (Namponda and Msimbati). There is no certainty that all octopus traded are caught in the Marine Park, a proportion may be caught in Mozambique. During spring tides, 800 Kg of octopus a week are collected from Namponda and 350 Kg from Msimbati. Other areas providing octopus are Ngao, Naumbu and Imekuwa. 20 agents with boats also operate in Mozambique providing each 350 to 2500 Kg of octopus per month (spring tide only) to the Mtwara based exporter.

35 to 50 mt of octopus are sent to Dar es Salaam every month, 10-15% comes from agents in the Marine Park. The processed octopus is then sold to wholesalers in Europe for 3-3.5 USD/Kg, the exporter's profit is on average 0.8 USD/Kg of octopus sold, and 500 mt to 700 mt may be exported per year from Tanzania and Kenya. Mtwara based exporters only buy octopus above 0.5 Kg.

The mark-up on lobsters, which are also exported, may be up to 150% for the traders or agents. Lobsters are bought on average for four USD per Kg from the fisher and are sold to the exporter at 5.5 USD to 8 USD/Kg according to the size (from 0.3 to above 1.5 Kg, the optimum size being 0.5 to 1.5 Kg). Smaller size lobsters are generally sold by non Marine Park fishers direct to the exporter (Less than 0.3 Kg at a price of 2.5 to 3 USD per Kg). The exporter sends on average 150 kg of lobster to Dar es Salaam.

Prawns are mainly sold in Mtwara and around, some are sent inland. The mark-up is between 30 and 80% depending on the market targeted.

Traders are not organized into cooperatives but sometimes operate in groups of 2 to 4 (particularly for dried fish trading) and share the profit equally. Furthermore, informal agreements exist between traders and fishers; traders lend money to fishers with the understanding that the fisher will sell his catch to the trader. This is a source of conflict (see section 4.6).

4.5.2 Summary of perceived changes

Perceived changes were mentioned in the section above for each trade and this shows that except for sea cucumbers, most trader groups perceived an increase in the number of traders operating in the villages (whether from within or outside the Park villages). This was not the case in Mitambo where a drop in the demand has been noted by traders. The reason for this is believed to be an increase in poverty at the village level.

'Dagaa' traders (dried or fresh) have noticed an increase in the amount of fish available whereas all other trading groups mention that the fish available has decreased at the local level.

The size of prawns, octopus and lobsters is perceived to have decreased in the last 10 years and the availability of prawns and lobsters to have dropped.

Most traders mentioned that their income has increased due the price increase. This was not the case for Msimbati, where competition (large numbers of traders) may be keeping prices down.

4.6 Conflicts, issues and challenges

Conflicts were investigated in the focus groups. The aim was to identify whether conflicts or issues existed between marine resource stakeholders and the reason behind these. No major conflicts were detected through the group discussions, however several issues emerged. These are presented in Table 24 below.

Table 24: Conflicts and negative attitudes

Stakeholders	Marine Park Authorities	Government	Traders/Buyer	Fishers
Fishers	-Ban of gear (small mesh nets, beach seines, spear guns) without alternatives. Misinformed mention of handlines, and prohibition of youth to fish (Msimbati). -Lack of adequate consultation prior to enforcement of Marine Park rules. -Lack of adequate information on Marine Park rules. -Not enough discussion and use of force	**Fisheries Division**: -Complex regulations. - Fishing licenses too costly and far to get (no outpost of fisheries Department in the Marine Park). **Forestry Department**: Allows cutting of mangroves whereas it is important for the fish.	**Traders**: -Low prices of products -Loan repayment obligations too demanding	**Beach seines**: depletion of fish stocks **Offshore fishers**: depletion of fish stocks (Mitambo)
	-Passive attitude towards hippos and crocs which cause many casualties (Kilambo, Mitambo)			
Shell fishers	-	-	-	**Beach seines**: Destruction of stocks
Seaweed farmers	-	-	**Buyers**: Low prices and unreliability	-
Traders	-Gear ban has decreased the availability of some fish. -Lack of knowledge of Marine Park plans thus fear of future	**Fisheries Division**: Introduction of a gate pass. **Village government**: ('*ushuru*') taxes even when they do not sell what they have bought	**Outside traders**: competition (increase prices and decrease fish available for local traders)	-Unreliable. Do not fulfil obligations attached to loans provided (sometimes sell to outsiders). -High prices -Low quality of some products (prawns and octopus)

(Source: Focus group discussions)

4.6.1 Marine Park related issues and conflicts

As expected, a number of issues were brought up by fishers in relation to the Marine Park's presence. Fishers resent the Marine Park for enforcing the ban on beach seines in 2003 and confiscating some gear as well as for planning to ban small mesh size nets and spear guns. It also came out from the interviews that some user groups believed in Msimbati that hand line fishing and young fishers would be banned from fishing. Although this results from ill informed rumours, the Marine Park needs to be aware

of the effects that the gear ban may have had on communities' attitudes. These reactions may justify the Marine Park carrying out more information campaigns in the villages. The main complaints about the gear ban was the little warning, the lack of consultation and the lack of alternatives proposed. The perceived forceful approach taken by the Marine Park was also an issue raised by a few of the focus groups. In addition, groups highlighted the fact that despite the ban on small mesh size nets they are still sold in Mtwara where the gear shops are based.

However, a number of groups mentioned their dislike of beach seines and see them as destructive and responsible for the decline of stocks (fish and shells).

Fishers feel there is little communication, and little education efforts from the Marine Park to the communities. Traders had similar concern and mentioned that they were not informed enough about the Marine Park activities and thus feared for the future of their activity.

Another issue raised by mangrove villages (i.e. Mitambo and Kilambo) is the disinterest of Marine Park authorities in relation to crocodiles and hippos attacks, which are frequent in these villages.

Again, this could be an opportunity for the Marine Park to increase information about wildlife and its importance. Further education on ecological processes and the functioning of ecosystems with all their components may be a way to increase communities' understanding of the aims and objectives of the Marine Park. The Marine Park carries out educational and awareness activities, particularly through revising the school curriculum, however more efforts may need to be done to target villagers directly.

4.6.2 Costs, licenses and loan related issues

The other main issues focused on loans and licenses. Loan issues relate to informal agreements between fishers and traders. Traders advance money to fishers who in turn have to sell their fish to them. This is a strategy for the trader to ensure access to some of the catch despite the high competition, and it also ensures that the fishers can operate. However, On the one hand, fishers complain that loan conditions are constraining and difficult to meet. On the other hand, traders complain that fishers do not abide by the agreement and sell to other traders. Traders mentioned that they are occasionally left without any fish to buy, or that fish sold to them by the fishers are of poor quality. This issue was raised in a number of other locations on the coast of East Africa (Malleret King *et al*., 2003) where these types of agreements are common.

The increase in the demand for fish in the Marine Park, particularly due to the influx of outside traders and dealers in recent years has led to a situation where fishers' production cannot satisfy traders' demand, even more so since beach seines have been banned (according to traders). Local traders find themselves unable to buy fish occasionally.

The difficult access to funds (e.g. to buy more sea worthy boats) was often mentioned as a constraint by fishers, forcing them to concentrate their fishing inshore where the pressure on resources is already highest. The escalating prices of raw materials (e.g. wood, boat making, fishing gear etc.) contribute to this situation.

The cost of operating was one of the issues raised by traders and fishers, particularly the cost of licenses. One of the fishers' main complaints is that in order to get their fishing licenses they need to go to Mtwara as there is no fisheries outpost based in the Marine Park. This is perceived to add a cost to the license itself. As a result few fishers get a license at all. Traders complain about the trading taxes imposed by village governments.

4.6.3 Other issues

Other issues raised by the focus groups were:

- Complex and difficult fisheries regulations to understand, thus difficult to apply.
- Fishers resent the Forestry Division for the fact that mangroves are perceived as being destroyed, whilst they have an important role for the fishery (this role was confused when investigated).Natural Resources Department/Forestry Department (Mangrove Management Project) at the District level are responsible for licensing mangrove cutting. Some responsibilities are also devolved to Village Environment Management Committees.

4.7 Summary

MBREMP marine resource stakeholders are numerous and varied. They include fishers (residents of the Park, from outside the Park who fish in the Park, and residents of the Park who fish in Mozambique), traders (from the Park and from inland areas who operate in the MBREMP, in Mtwara, inland and in Mozambique), agents based in Mtwara, exporters based in Mtwara or Dar es Salaam. Stakeholders also include (in lesser proportion) net menders, boat builders, seaweed farmers. Local and village government are also stakeholders of MBREMP marine resources as well as the MBREMP authorities. Fishers and traders (men and women) are the most numerous stakeholders in the Park and thus were the focus of the use pattern research.

A wide number of gears and methods are used in the MBREMP, which include nets (set and active), spear like gear, lines, traps, and diving. Target species vary according to gear and fishing methods. Species fished include demersal fish (e.g. rabbit fish, emperors, snappers, juvenile fish), near shore pelagics (e.g. anchovies, sardines, mackerel, jacks), larger offshore pelagics (e.g. tuna, bonito, sharks, king fish etc.), and prawns, particularly in the mangrove villages. Fish is sold fresh or dried, whole or in pieces, to local and regional markets. Sea cucumbers, octopus and lobsters are also targeted, mainly for export (to Europe for octopus and lobsters, and Asia for sea cucumbers). Sea cucumbers are boiled and dried then exported. Octopus and lobsters are exported frozen.

A huge variety of shells is fished for a diversity of purposes and markets (local, Asia, Europe, USA). Small gastropods and bivalves are gleaned in the intertidal areas of the Park for food and lime production for the local market (e.g. cockles, oysters, pen shells etc.). Larger ornamental shells (e.g. Giant tritons, helmets etc.) are fished for their shells (e.g. for tourists, shell collectors) and usually exported. Shells are also fished for their opercula (e.g. rock shells) which are exported. All shell meat is consumed locally, either boiled or grilled.

Fishing is carried out inshore mainly with small dug out canoes that are poled or sailed. Motorised boats are scarce in the Park and all belong to owners who are based outside the Park. The size and quality of the boats constrain fishers to inshore waters. Boats are owned by '*tajiri'*, by the fishers themselves, are rented or borrowed, but most fishers have access to boats. More than 60% of fishers (individually, or in group) own a boat except in Msimbati where only 30% do and most use '*tajiri*' boats.

Similarly fishing gears may be owned by one fisher or a group of fishers, by a '*tajiri*' who employs a crew, rented or borrowed. Nets are often owned by groups of fishers, whereas lines, spears etc are owned by one individual. In Msimbati however it was found that most nets were owned by '*tajiri*' who. In the surveyed villages, the most widely used gears were found to be handlines (27% of fishers in seafront villages and more than 50% in mangrove villages), '*tandilo*' (23 o 27% of the fishers in both areas), other nets (18% use large nets in surveyed seafront villages). In terms of numbers of people and household involved, *'tandilo'*, handline, shell collecting are the most important activities.

Marine product trading in the Marine Park include fresh fish and dried fish (including *'dagaa'*) which represent the most number of traders, octopus, potentially shells particularly opercula and sea

cucumbers. The presence of agents and exporters of octopus, shells and sea cucumber in Mtwara and sometimes in the Marine Park provides traders with secure markets.

Fishing is dominated by men, except for '*tandilo*' fishing, which is almost exclusively carried out by women. Similarly trading is dominated by men except for trading '*dagaa'* (fresh or dried) which is also done by women. Gear choice is mainly driven by costs (the most expensive gear being nets) but also skills and age.

The best fishing areas, and thus most pressured are Litokoto, Bahasha and Namponda (see Map 3). However for a number of net fishers and line fishers, Mozambique is considered to provide the best fishing grounds. Mozambique was found to be an important source of marine resources, particularly for shells, sea cucumbers, octopus, either directly by fishers or by traders who buy products from Mozambican fishers at the border. In relation to the overall trade of sea cucumbers and shells, agents considered that most were coming from Mozambique.

Although fish trading is mainly local, an increasing number of fish traders come from inland (as far as Tunduru) to buy fish in the Park on a seasonal basis. Similarly, local traders sell their products inland. The high demand creates a situation where fishers are in a good bargaining position and prices may rise significantly in the peak season. Local traders however consider themselves in a weak position in comparison to inland traders which purchasing power is higher. Agents and exporter focus on sea cucumbers, shells and octopus, which are bought in Mtwara, and then transported in Dar es Salaam, processed if necessary (in the case of octopus) and exported to different markets. It is estimated that 1.5 mt of sea cucumbers, 50 mt of cowries, 30 mt of opercula, 300 mt of octopus (30 mt from the Park area) could be exported from Mtwara per year. This would include the Park areas, and surrounding areas as well as Mozambique. For agents, the Marine Park is an important source of octopus and shells (opercula).

As in other areas of the East Africa, fishing was found to be affected by seasons and tides. Three seasons were identified, the Southeast Monsoon, Northeast Monsoon and '*Matalai*' between the two main monsoons. Other studies usually identify two main seasons, the Northeast and Southeast monsoons (King, 2000; Obura, 2001). The preferred seasons for fishing are usually the Northeast monsoon and '*matalai*' when the wind is less. However it was found that for sea cucumber fishers (this was confirmed by the agents), the Southeast Monsoon is the best fishing time. Tides affect fishing. Fishers mostly go out at low tide and come back with the high tide. Spring tides are considered as most productive and this is when the bulk of octopus are caught. Shell fishing is occasional and mainly carried out at low spring tides.

Seaweed farmers are now few in the Marine Park, and their activity is also best during the Northeast Monsoon.

An interesting phenomenon was detected in the Park area. As mentioned above, the Northeast Monsoon is considered as the best period by fishers. This is the case also for traders for a number of reasons, first more fish area available to buy, but also prices are higher due to the increased purchasing power of households who harvest cashews. This is an interesting point and may contradict the idea that when income increases, marine resource exploitation may reduce. Fishers indicated that during the cashew harvests, they reduce their fishing time and contribute to farming activities, however at the same time, that some hand line fishers enter the fishery as the demand increased dramatically. Trading activities increase significantly and women trade just for the season. Similarly, outside traders come to the Marine Park to get fish, as purchasing power also increases in inland districts where cashews are cultivated. Prices increase, for example, '*dagaa*' may double as. The dry season is also preferred due as fish dries better and quality is highest.

Prices are affected by demand (larger markets such as Mtwara fetch higher prices than those in the Park); by the season, which affects both the quality of the product and the demand. Fisher prices vary mainly according to the type and size of fish, but also location. Trader prices depend on the product, the time of the year and the demand. Prices have increased in the recent years particularly sea cucumber prices for both the fishers and the traders.

Although information on catch and income were difficult to get from fishers, it came out that nets, spear guns, sea cucumber fishers got more income on average. Traders' margins vary between 30 and 150%. The sea cucumber traders were probably the better off.

Discussion with focus groups revealed that resources are considered under pressure, the number of fishers has increased and resource are perceived to have decreased, particularly sea cucumbers and ornamental shells, and some fish. For agents, Mozambique sea cucumbers and shells are also declining and it takes agents much longer to get the quantity they need to transport to Dar, than it used to 10 years ago.

The only production that has been perceived as increasing is the opercula. *'Tandilo'* fishers and large net fishers have also noticed an increase in their catch in the last 10 years, which they attribute to the effective ban on dynamite fishing. Other fishers have observed a drop in the catch. At the same time trade has increased, and prices have increased. The drop in catches has not always been compensated by the increase in prices except for sea cucumber fishers.

No specific conflicts were detected between users, except a general dislike of beach seines, which are perceived to be destroying the resources. Resentment was also found against the Park, particularly against the MBREMP approach to gear bans, and feel that there has been little communication between the Marine Park authorities and the communities. Resentment was also detected against the village government, who is perceived to allow resources to be destroyed (i.e. mangroves). Finally a conflictive relationship between traders and fishers has been found. Fishers need capital, traders provide them with loans in order to secure products to buy. However, the competition is high and fishers sell to the best bidders with little consideration to the trades who lent them money, and may find themselves without fish to buy.

There are no organisations of traders or fishers at the Park level. The lack of trust between fishers and traders was found to constrain opportunities for individuals involved in fisheries activities. The informal agreements described above are ways to reduce the lack of access to funds for fishers, which is characteristic in the region (Malleret King *et al*., 2003).

5 Socio-economic status

5.1 Measuring socio-economic status

5.1.1 Material Style of Life data indicator

One of the objectives of the socio-economic assessment was to investigate Marine Park households' well being and explore the link between activities and socio-economic status, particularly of households involved in the exploitation of marine resources. This was done using a material style of life (MSL) indicator rather than calculating incomes.

MSL was used rather than income because income is one of the most difficult and data intensive measures to obtain. It requires lengthy studies that often do not produce adequate results (Maxwell, 1996). Indirect indicators have been developed to measure wealth, or relative wealth (Maxwell and Frankenberger, 1992). Material Style of Life (MSL) data was used in this study to give an indication of wealth across Marine Park communities. This indicator uses household assets as indicators of wealth/poverty. A list is determined by local stakeholders who also rank them according to the wealth status they indicate (Pollnac and Crawford 2000; Berkes *et al*., 2001?). Each item was given a score that was expressed as a proportion of 10. The MSL score (out of 50) was calculated by adding these scores.

The MSL data collected was adapted from previous studies (Pollnac and Crawford, 2000; Malleret King, 2003). Because MSL wealth criteria were investigated through interviews, the assets taken into consideration (see table 25) for the calculation of the MSL score are based on local specific criteria (as perceived by communities). Assets considered are: housing (roof and wall material) and their condition (bad to good), livestock (number and type of livestock owned from none to cows), ownership of transport (type of transport), access to water (from public to private wells), access to power (none to private owned generator), land ownership. The higher the score, the wealthier the household is (see table 25).

Households could own several houses, in which case each house was given a score by the interviewer according to the predefined criteria (see table 25). Interviewers noted the number of houses with each identified item (wall material and roofing) and an average house score was determined for each household. This average score was weighted by the house ownership score then added to the score obtained by the other items.

(1) House score= (Score material and condition for roofing and walls*number houses/total number houses)*house ownership score.

In order to be able to take account of both the number and type of livestock owned in the household MSL scores, a simplified equivalence system based on the price of livestock was used. 10 chickens were found to be equivalent to 1 goat or sheep and 10 goats or sheep were found equivalent to 1 cow. (1 chicken is worth 1 to 1.5 USD, 1 goat or sheep is worth 15-20 USD on average, and a cow is worth 150-200 USD).

Access to water was in the end not taken into consideration in the calculation of the household MSL score as no variation of the scores could be attributed to this item as all households had access to wells or village pumps. Some households were found to buy fresh water as none is available in their area (Litembe particularly), however this did not indicate wealth.

Tables 25: Components of the households MSL index

Walls	Score	Number houses
No house	0	
Thatch bad condition	1	
Thatch good condition	2	
Mud bad condition	3	
Mud good condition	4	
Stones or Mud bricks (partial)	5	
Stones or Mud bricks (all the house)	6	
Cement blocks (partial)	7	
Cement blocks (all)	8	
Plaster and paint (partial)	9	
Plaster and paint (all)	10	

Roofs	Score	Number houses
No roof	0	
Thatch bad condition	1	
Thatch good	2	
Corrugated iron bad	3	
Corrugated iron good	4	

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

Transport	Score
None	0
Bicycle	1
Car	2

Access to power	Score
None	0
Battery/solar	1
Generator	2

All categories (e.g. livestock, power, house etc.) were given the same weight in the household's total MSL score as was done previously (Malleret King, 2000).

Basic statistics as well as ANOVA, Ttest and Pearson correlations were used to analyse to the survey results. In order to determine the Pearson correlation coefficient for the different parameters investigated, data was aggregated at the village and quarter level. A Bonferroni statistic test was performed to detect significant correlations (using Systat 10.2).

5.1.2 Investigating income derived from Fishing

Despite the difficulty to get income information, a rough estimate of income derived from fishing was sought (see questionnaire Appendix 7). This was an attempt to get an indication of the monetary value of fishing at the household level and had potential to complement the information obtained through the MSL data. Households specified the bracket that reflected best their income from fishing according to seasons. A rough average yearly household fishing income was determined according to:

- Number of days fishing per week (see Table 8)
- The number of months fishing per year (see Table 8)
- The number of fishers in the households.

Basic statistics as well as ANOVA and Ttests were used to investigate the links between income estimation, location and fishing systems (gear, boats, etc).

5.2 Results: Asset distribution

5.2.1 House characteristics

Most houses are made of mud walls and thatch roofs. A few houses are made of cement blocks, have tin roofs and are plastered and painted. The largest categories in most villages are good or bad condition (disrepair) mud walls, and good and bad condition thatched roofs, except in Mahurunga where grass roofs are more numerous. Tin (corrugated iron) roofs were least in Litembe and most in Mahurunga (28% of the houses sampled) and Msimbati (20%) as shown in Figures 11 and 12.

Figure 11: Different wall types as a % of households per village

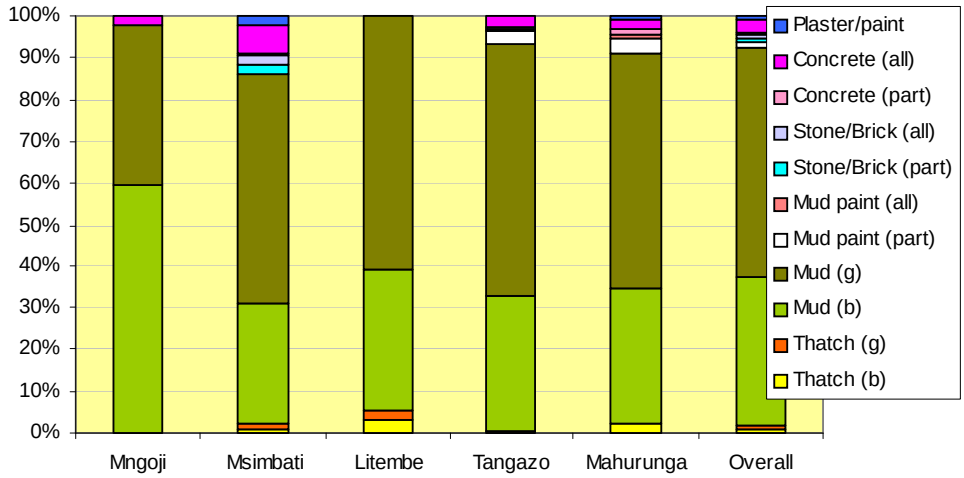
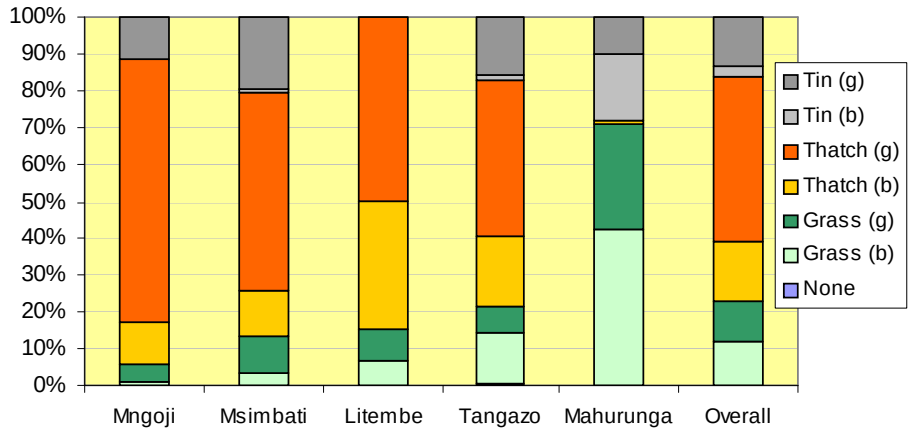


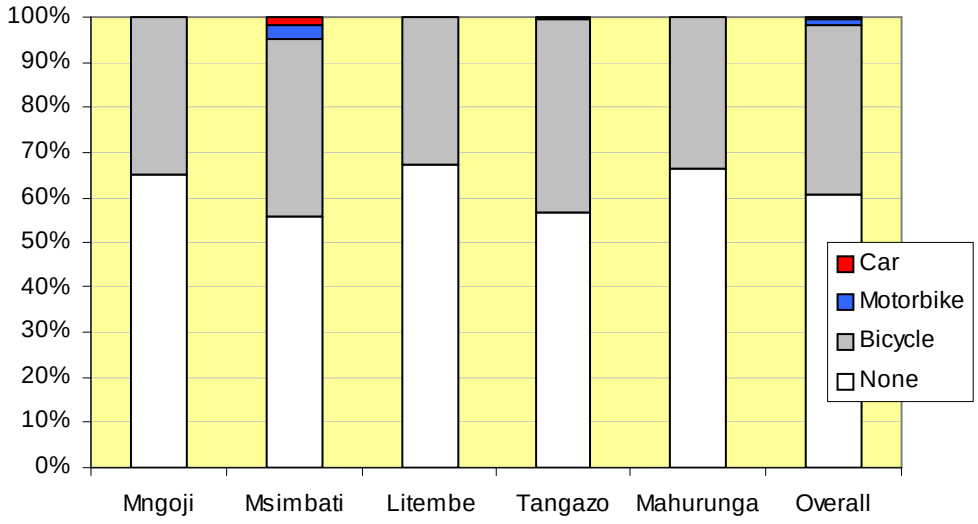
Figure 12: Different roof types as a % of households per village



5.2.2 Transport

As shown in Figure 13, the majority of households did not own any transport (60.7% of the total sample) but a large percentage owned a bicycle at least (38%). Ownership of motorbike and car was only encountered in households sampled in Msimbati. The pattern was relatively homogeneous throughout the villages.

Figure 13: % of households owning different type of transport facilities



5.2.3 Access to power

98% to 100% of the households sampled had no private access to power. Very few households were found to have generators or solar batteries. The few that did were located in Msimbati and Tangazo.

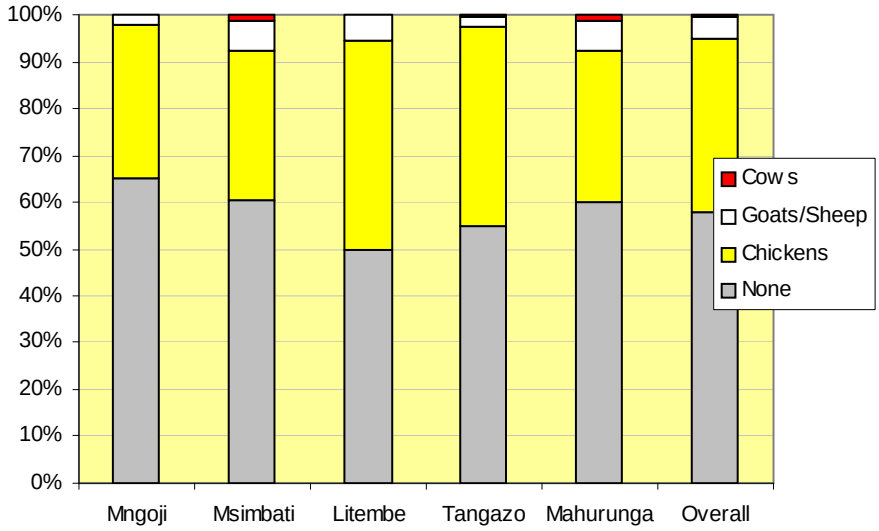
5.2.4 Access to water

Most houses had access water at village pumps or wells. However it was found that a number of households had to buy fresh water, particularly in Litembe (67% of the households sampled). Private access to water was in the end not considered as a good component to indicate wealth and thus was not taken into consideration in the total household MSL scores.

5.2.5 Livestock

Results of the household survey confirm those of the occupational structure (see occupational structure attached -Malleret and Simbua, 2004) which showed that not more than 10% of households had livestock as a business. 43% of households sampled owned livestock, mainly chickens (20 to 30% households), goats and sheep in a much lesser proportion (2 to 6% households) and a few households owned cows in Mahurunga and Msimbati (see Figure 14).

Figure 14: Livestock type as a % of households per village



5.2.6 Ownership of land

The socio-economic vulnerability of a household is determined by the past (e.g. past crisis and strategy used by the households to cope with the crisis) and by the present (Swift, 1989). In coping with crisis (e.g. food or financial crisis), selling assets is a common strategy used by the households. The sale of productive assets, such as land, is often the last resort and is the strategy that affects most the capacity of households to go back to a pre-crisis condition; it increases their vulnerability highly (Nyborg and Haug, 1995). Information on land ownership was thus considered as an interesting insight in to the Marine Park's households' socio-economic vulnerability, and thus their capacity to cope with crisis (e.g. marine resource depletion or changes in natural resource management regime).

It was found that households borrow or rent plots to farm, particularly in seafront villages (24% in Mngoji and 26% households in Msimbati). Five % of all households surveyed did not farm and a higher proportion in Msimbati and Tangazo (8-9% of households in both villages). Similarly, a small percentage of households rent or borrow houses, the highest percentage of households living in rented or borrowed houses was found in Mngoji (14% of households).

Most households considered they owned the land they were farming (78%) or living on (85%). However, out of these only a few were found to have title deeds and they were mainly located in Tangazo (12% for farm and 14% for houses) and Mahurunga (3% for farmland, 2% of houses). 0.5% of households have a title deed for their farmland in Msimbati.

Figures 15 and 16 show the different type of land ownership in proportion to the number of households.

Figure 15: Status of ownership of houses

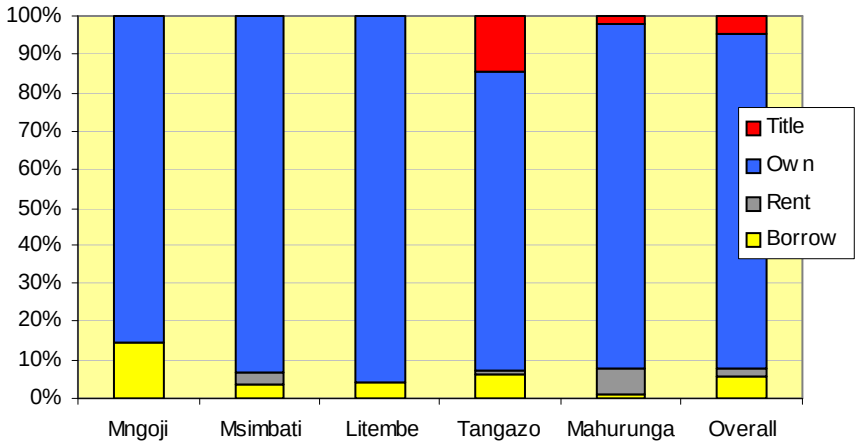
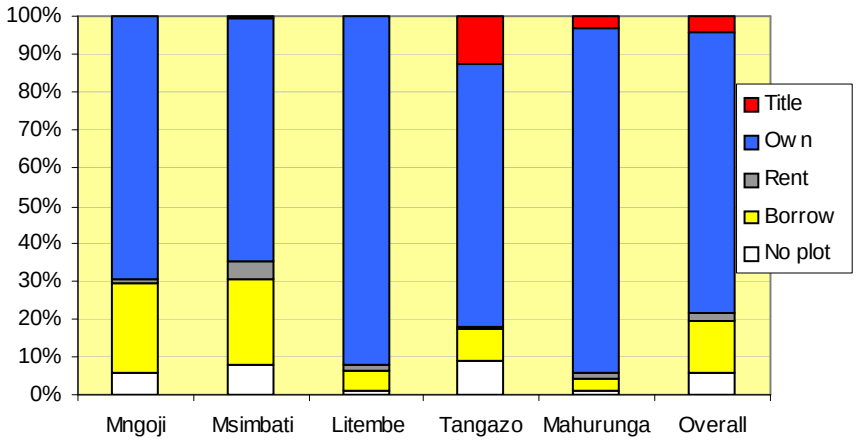


Figure 16: Status of ownership of farming land



5.3 Investigating links between wealth and activity

5.3.1 Factors taken into consideration

The link between activities and MSL scores were explored according to a number of factors (Table 26) such as the household's main source of income (highest rank), the main source of food, whether the activity was marine related or not. For households whose main source of income was a marine resource associated activity, the impact of factors such as the type of fisheries related activity carried out, the number of activities were also explored. This was also done for households whose main source of income was found to be "other" natural resource related. Demographic and geographic parameters were also taken into account.

For fishing households, the link between MSL score and boat use, gear used, type of boat used were investigated. Factors likely to affect the MSL score are presented in Table 26.

Table 26: Factors taken into consideration for the analysis of MSL scores

Factors	All households	Marine dep. Households	Fishing dep. households	Other natural resource dep. Households
Geographic	Village	Village	Village	
Demographic	Household size, Gender of the Head of Household (HH)	Household size, Gender of the HH	Household size	
Main activity	Number of activity, income, marine/non marine, crops, Marine dependence only.	Type of marine dep. activity, Sole dependence on Marine res.	Number of activities	Type of other nat. res. based activity
Fishing system			Gear, boat use, boat ownership.	

Only significant results are presented in this report, these are summarized in Tables 27 to 29. Results are considered significant for $p<0.05$.

Table 27: Significant variations detected using ANOVA

Factors	All households			Marine dep. Households			Fishing dep. households			Other natural resource dep. Households		
	N	F	p	N	F	p	N	F	p	N	F	p
Village	620	2.7	0.003									
Only source of livelihood	210	3.6	0.002									
Type of activity				150	4.4	0.00				19	79.8	0.00
Type of boat							72	3.5	0.03			
Gear 2										174	2.5	0.02

Table 28: Significant variations detected using simple T test.

Factors	All households			Marine dep. Households			Fishing dep. households		
	N	t	p	N	t	p	N	t	p
Gender HH	634	5.4	0.00						
Marine resources only source of livelihood				220	4.7	0.00	158	2.7	0.02
Area (excluding Mahurunga)							169	2.5	0.02

Table 29: Significant Pearson correlation

Factors	All households			Marine dep. Households			Fishing dep. households		
	N	r	p	N	t	p	N	r	p
Number of activities	640	0.104	0.02				170	0.172	0.03
Sole dependence on Marine resources				220	4.7	0.00	158	2.7	0.02
Area (excluding Mahurunga)							169	2.5	0.02

5.3.2 At a general level

Results of the analysis of variance show that there is a significant difference in the scores across the villages. On average, households in Msimbati and Tangazo are better off than in other villages (Table 30).

Table 30: Average MSL score per village and rank according to the score

Village	Average MSL	Rank
Msimbati	7.8	1
Mngoji	6.9	3
Litembe	6.7	5
Tangazo	7.7	2
Mahurunga	6.8	4
All	**7.4**	

This may be due to the fact that these villages were largest and possibly main trade centres, thus provide a wider spectrum of opportunities for households. The slight positive correlation of the Scores with the number of activities a household carries out may confirm this (Table 31).

Table 31: Significant correlation between number of activities carried out by a households and MSL score

	MSL Score
Number activities	0.143

Widow headed household were found to be poorer than other households on average (Table 32) as shown by the results below with an average score of 5.2 against 7.6 for other activities. This is similar to findings of other studies (Haddad *et al*., 1994).

Table 32: Significant difference in MSL scores between widow headed households and others.

Group	Average MSL
Non Widow HH	7.6
Widow HH	5.7

5.3.3 Wealth and activities

No significant relations were found between the activities and the household scores. However further investigations were carried out for two groups of particular interest to the Marine Park:

- Households whose main source of income is "other" natural resources for their livelihood,
- Households whose main source of income is provided by marine resources.

Results are presented in Tables 33 and 34.

Table 33: Average score according to main "other" natural resource activity

Activity	MSL score
Salt	18.4
Traditional Doctors	6.6
Carver	6.4
Charcoal	5.5
Weaving	4.7

On average households whose main source of income was weaving were found to be the poorest of the group with charcoal producing households slightly better off. Households whose main source of income is salt production were by far the wealthiest. This category though included mainly saltpan owners and managers.

Table 34: Average score according to main Marine dependent activity

Activity	MSL Score
Trader Sea cucumber	10.3
Fish Trader	9.0
Fisher	6.8

Results presented in table 34 show that sea cucumber traders are on average wealthiest of households whose main source of income are marine resources while fishers are worse off.

Although no significant differences could be detected in wealth according to whether households were involved in marine associated activities or not, results show that marine households whose only source of livelihood is based on marine resources are significantly worse off than other households (respectively a score of 4.9 and a score of 7.8 in Table 35). This confirms previous studies that show that households relying on one activity only were usually poorer and more vulnerable than other households were due to the low risk spread (Anderson and Ngazy, 1998; Malleret King *et al*., 2003)

Table 35: Average score according to whether a marine dependent household depends only on marine resources for its livelihood or not.

Activities	MSL Score
Marine resources and other	7.8
Only marine resources	4.9

Investigations were carried out at the fishing household level, particularly to detect whether wealth varied according to the characteristics of households' fishing systems (e.g. gear, boats, days fishing etc.)

As for other households fishing households' status is positively affected by the number of activities a household has. The poorer fishing households were found to be those whose only source of livelihood is fishing (see tables 36, 37).

Table 36: Average MSL score of fishing households according to whether fishing is their only source of livelihood or not

Activity	MSL Score
More than fishing	7.0
Only fishing	5.3

A significant positive correlation was also found between the number of activities carried out in the households and the MSL score.

Table 37: Significant correlation between the number of activities and fishing households MSL score

	MSL Score
Number of activities	0.172

Marine dependent only households were also found to be smaller than the sample average with 2.5 household members on average rather than 4.2. No age pattern was found despite the suspicion that households depending only on marine resources for their livelihood (smaller sized households) could be households of younger fishers, just establishing themselves as was found in previous studies (King, 2000). However this was not confirmed statistically in this study. The majority of these households were located in Msimbati (63%) and Tangazo (30%), the largest villages sampled.

A significant difference was found in the scores of households dependent on one activity according to this activity ($N=210$, $F=3.6$, $p<0.01$). The wealthiest households were those exclusively dependent on other businesses (builders, shop owners, wine traders and other small businesses), the poorest were found to the artisans. Farming households came second (see Table 38). If one only takes account of categories where the number of households exceeded 5 (1 or 2 households may not be representative enough), households exclusively dependent on marine resources (of which 70% are fishing dependent only) and on other natural resources (weavers and carvers) were the worse off.

Table 38: MSL score comparison according to exclusive source of livelihood

Only source of livelihood	MSL Scores	Rank	N household
Other business	9.028	1	6
Farming	6.877	2	189
Other Natural resources	4.913	3	6
Marine Resources	4.5	4	14
Employment	3.571	5	1
Artisan	1.786	6	2

5.3.4 Socio-economic status of fishing households and fishing systems

The MSL scores were tested against a number of fishing systems components. Few of these components were found to affect household wealth. Significant differences were not found between fishing households who did not use a boat and those who did contrary to previous studies such as Malleret King *et al.* (2003). This may be because the large majority of fishers use boats in the Marine Park.

Boat owners however were found to be wealthier than other fishers were, and the type of boat owned reflected the wealth of the fisher (Table 39). Thus fishing households who owned *'mashua'* were found to be significantly wealthier than those who owned *'dau'* and dug out canoes. This was also found by Malleret King *et al*. (2003) elsewhere in Tanzania.

Table 39: Average MSL score of fishing households according to the type of boat owned

Type of boat owned	MSL Score
Dug out	6.8
'Dau'	8.1
'Mashua'	9.0

Significant variations of the MSL score were not found in relation to gear.

However, the estimated yearly income of fishers was found to vary according to the gear used. Only households using one gear were taken into consideration for this investigation due to effects of multiple gear use and to reduce the complexity of the analysis. Results are presented in Table 40.

Table 40: Estimated yearly income in USD per fisher according to gear

Gear	Yearly income per fisher	Rank	N
Spear and hand	1000	2	
Handline	344	5	
Traps	717	3	
Net. Mesh >= 3"	242	7	
Net. Mesh 2-2.5"	106	9	
Net. Mesh 1.5"	257	6	
'juya'	1305	1	
Beach seine	400	4	
'tandilo'	169	8	

Gear shaded in grey are gears that were represented by only one household in the selected sample (fishing households, with only one gear) thus results for these may be dubious. All the rest were represented by 5 to 20 households.

Results of the ANOVA on the yearly income per fisher suggest that income varies according to the gear used. Fishers who fish with '*juya*' appear to earn most, are get more income that other fishers on average (1000 USD per year), second come traps and (700 USD) then handline, and nets (3, and 1.5"). Income derived by fishers using *'tandilo'* only and medium mesh size nets earn significantly less than other fishers. These results do not confirm fishers' perceptions that net fishers earn more than others do. Although a number of households use two to four gears, 73% of the fishing households were found to use one gear only. This sample should thus be representative.

5.4 Summary

Measuring well being and/or wealth is difficult because both are a complex make up of various entities that have not yet been fully grasped. As a result, a large array of indirect indicators have been developed in recent years, focusing on households assets, health, food security, access to services etc. In this study a simple index based on household assets (known as Material Style of Life - MSL - data) was chosen as an indicator of households' socio-economic status. A similar indicator has been used in the context of coastal communities in Asia and in East Africa (Crawford and Pollnac, 2000; Malleret King *et al*., 2003). Although not comprehensive, this indicator can provide information on the relative socio-economic status of households.

On the basis of local based wealth/poverty criteria, the MSL index was established. This index took into consideration, housing (material and condition) and land/house ownership, livestock (type and number owned), private access to power, private transport. Basic analysis of these items showed that the majority of surveyed household live in mud houses with thatched roofs, that very few have private access to power. It also showed that a majority of households have no private transport but that a third and more have at least one bicycle. Households rent or borrow plots to farm, especially in Msimbati, otherwise the majority consider they owned the land used. Houses and plots are also considered as owned by the majority of households. However, very few have title deeds. These households are located in Mahurunga and Tangazo. One household was found to have a title deed for farming land in Msimbati as well.

Factors affecting the households' socio-economic status were tested. Results show that the socio-economic status of households did not vary with the activities *per se*, however, it was found that the more activities the households depend on, the better off they are.

Fishing households or marine dependent households were not found to be poorer than others were. However, households depending mainly on fishing (fishing as main source of income) were found to be significantly worse off than other marine dependent households were, sea cucumber traders being best off for marine dependent households. Similarly, households dependent mainly on weaving were found to be the worse off of the 'other natural resource dependent' households, whereas saltpan owners and traditional Doctors were better off in this category.

Confirming the fact that households with spread risks (dependent on a variety of activities) are better off than others was the result that households solely dependent on marine resources for their livelihood were worse off than other households (overall) were. They were also worse off than households dependent on only one activity that was not marine resource related.

Significant effects of the fishing systems were not detected (that is, gear used, access to boats) on households' socio-economic status. Boat use was not identified as a significant factor contrarily to other studies in East Africa (Malleret King, 2000; Malleret King *et al*., 2003). However the type of boat owned (if owned) reflected the general socio-economic status of the household. Households who own a boat

(*'mashua'*)are better off than those who own a '*dau*' who are better off than those who own a dug out canoe.

From this investigation it comes out that households solely dependent on marine resources are one of the most vulnerable groups in the Park. The size of these households tends to be smaller on average than other households, houses tend to be in bad condition, and often they rent or borrow land.

On a more general note, differences were found between communities with Msimbati and Tangazo better off and Litembe worse off of the surveyed villages. Reasons for this were not found, except that opportunities may be greater in larger villages that are the main trading centres in the Park. Widow headed households were found to be more vulnerable compared to other households which is common and often widow headed households are considered as a particularly vulnerable group.

Results of impacts of gear on estimates of yearly income per fisher suggest that '*tandilo*' fishers earn significantly less than others, followed by net fishers (2-5"). The largest incomes were found for smaller meshed sized nets and traps. This does not confirm fully the focus groups' perceptions that in terms of income nets are best and traps one of the worst gears.

Table 41: Summary results

Factors	**Wealth +**	**Wealth -**	**Worst off**
Location	Msimbati, Tangazo	Litembe	
Gender	Men	Widow headed households	
Activities	Several	Only one	Solely on marine resource
Marine dependent	Fishing	Trading	
	Several activities		
	Boats	Dug out canoes	
	'*juya*', traps, handlines	Tandilo, large nets	

6 Discussion and recommendations

6.1 Issues and suggestions for management and livelihood development

This baseline assessment provides a good knowledge base and a foundation to understand MBREMP communities and their socio-economic context. It provides a broad understanding of the threats on marine resources, the way in which these resources are exploited, and which resources could be under most pressure. This assessment also shows how wide the spectrum of people (local, national and international based) who are involved directly or indirectly in marine resource extraction in the Park is.

A summary of the main issues uncovered by the socio-economic assessment is presented below. Section 6.2 focuses on recommending a socio-economic monitoring process for the Marine Park.

6.1.1 Main sources of threat to MBREMP marine resources

Most fisher and trader groups interviewed have perceived a decline in the marine resources in general or in specific species. This would indicate that the marine resources in the MBREMP are under high pressure, which confirms the findings of the biodiversity assessments carried out in the MBREMP (Obura *et al*. 2004; Richmond, 2004). On the basis of the findings of this socio-economic assessment, the main sources of pressure on marine resources are:

- The number of people involved in marine resource extraction
- The dependence of the communities in general and specific households in particular on marine resources for their livelihoods
- Poverty/lack of access to funds
- The demand for marine products and the volume of trade for specific marine products
- Destructive fishing methods.

Although these points are presented separately, they are interlinked (e.g. volume of extraction responds to the demand etc.).

6.1.1.1 On numbers of users, household dependence on marine resources and vulnerability

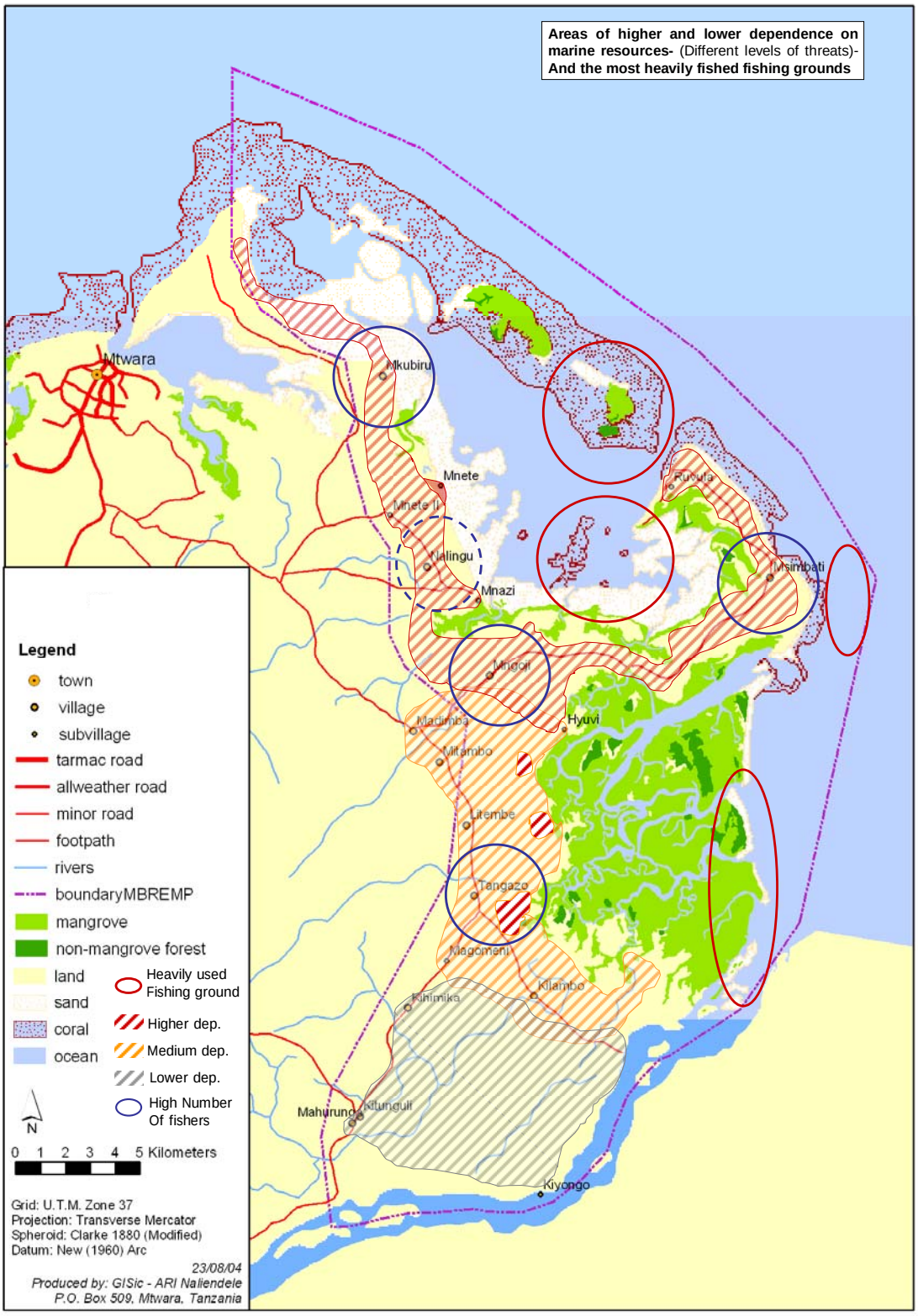
The volume of people extracting marine resources on a full time or occasional basis in the area is high particularly in seafront villages and Tangazo (estimation from the focus groups suggests that the total number of fishermen and fisherwomen, including shell fishers could be more than 1400 people). These include all types of fishing or resource extraction. Similarly a large number of individuals are involved in the trading of marine products (approximately 160), particularly in Msimbati. The demand and corresponding trade results in high pressure on specific resources that are already perceived as heavily depleted in the Marine Park, particularly ornamental shells and sea cucumbers.

The relatively high dependence on marine resources at the community level (particularly for seafront villages) as well as at the household level perpetuates the threat on marine resources. Fishing households' main source of income is fishing and time commitment to fishing is high. Although no specific analysis was done at the individual level, it is suspected that fishing may be an important source of income, and one of the sole sources of income for women who are involved in '*tandilo*' fishing.

Although dependence is high, few households depend solely on marine resources for their livelihood. However the ones who do will deserve special attention from the Marine Park when implementing new marine resource management regimes, because they emerged as the most vulnerable households.

When the zoning process starts as part of marine resource management, the high dependence of some villages on marine resources will have to be taken into consideration to avoid depriving these areas of their main livelihood activities. More effort may need to be made in developing additional livelihood opportunities in these areas (mainly the seafront villages, and Tangazo, see Map 4). It is worth emphasising that stakeholders and villages are heterogeneous in their relative dependence on marine resources, and this will have to be taken into consideration in the zoning process. Map 4 highlights areas where dependence on marine resources is the highest (blue circles on the Map shows where pressure on marine resources comes from) and areas where fishing pressure was found to be the highest (red circles on the Map, based on this study).

Map 4: Highest dependence on marine resources and heavily fished fishing grounds



6.1.1.2 On shell extraction and trading

Shell trading and collecting may not emerge as significant as fishing in the Marine Park however it involves hundreds of people, especially women. The decline of some species may have significant impacts on the reef ecosystem (TRAFFIC, 2001). Based on observation, the quantity of shells collected for food is extremely high compared to other places in Tanzania (Richmond, pers. comm.).

Shells may provide a significant and cheap source of animal protein for the Marine Park villagers. The level of use, the sustainability of the exploitation, the impacts of this use on the habitats, the contribution to households' diet may need further investigation, the results of which the Park should take into consideration when regulating the shell fishery.

6.1.1.3 On destructive methods

The impact on habitat and indiscriminate catch of small mesh size nets, and monofilament nets used in Litembe are considered as one of the most significant threats to the Park resources (Obura *et al*., 2004). Small mesh size nets are widely used in the Marine Park, they include '*tandilo'*, beach seines and some of the '*juya'*.

Actions have already been taken by the Marine Park management to ban beach seines, and some crews have stopped operating while others still operate illegally. Although the initial forceful approach taken by the Marine Park in banning and confiscating gear without suggesting alternatives was not appreciated by Park communities, this study showed that a number of fisher groups admitted they disliked beach seines and consider them destructive.

The situation for '*tandilo*' fishing is however very different. Difficulties for the Marine Park to regulate this activity may be numerous. '*Tandilo*' fishing is carried out by women, and may represent one of the only direct sources of income for women in the Marine Park. ' *Tandilo*' did not appear to be perceived as fishing *per se* and certainly was not perceived as destructive by any of the groups interviewed. Furthermore, due to the cultural and social context, finding alternative sources of income for fisherwomen may prove difficult. It would be essential that a gender and cultural study investigates further the importance of '*tandilo*' fishing for women as well as for their households' well being. With this knowledge the Marine Park would be in a better position to seek appropriate ways of regulating the activity in partnership with fisherwomen. Taboos, traditions, social pressure, time and financial commitment are all aspects that have to be taken into consideration when investigating alternative sources of income for this group.

It was found through the group discussion that a woman used a handline. It may be worth investigating this further as it may be represent a way of suggesting alternatives to '*tandilo*' fisherwomen.

6.1.1.4 Lack of organisation/lack of funds

No fisher or trader associations, cooperative or any form of user based organisation was detected in the Marine Park during the socio-economic assessment. At the same time, although access to funds was not discussed specifically in this study, the difficulty for fishers to access funds to maintain, upgrade or buy fishing gear (including boats) was mentioned by a number of fishing groups. This was perceived as constraining gear choices, and forcing fishers to fish in inshore areas. Conflicts detected between fishers and traders in relation to loans also reflect this issue, which is common in East Africa (King, 2000; Malleret King, 2000; Malleret King *et al*., 2003). Lack of funds also contributes to the weak position of local fish traders in comparison to outside fish traders operating in the Marine Park area.

Avenues such as providing an enabling environment for fishers and traders to organise themselves may be explored by the Marine Park in order to strengthen stakeholders' position for increasing their chances of accessing funds such as loans. Similarly, in the light of successful experiences in the region (Ireland (ed), 2004), encouraging micro credit schemes may be a way for the Park to contribute to reducing pressure on marine resources by alleviating financial constraints and increasing livelihood choices and opportunities for stakeholders.

6.1.1.5 The Mozambique issue

This socio-economic assessment shows that Mozambique is an important source of marine resources for the Marine Park fishers (net fishers, hand lines, octopus fishers), particularly in mangrove villages and even more important for Marine Park and Mtwara traders. Traders compensate the decline of MBREMP marine resources by buying fish, sea cucumber and shells harvested in Mozambique. Processed products may be of lower quality than in the Park, but they are much cheaper. Agents interviewed estimated that most of their products came from Mozambique. This was also found by TRAFFIC (2001) particularly for sea cucumbers and shells.

As resources decrease in the Park, trade and fishing in Mozambique have increased. However, pressure on Mozambique marine resources has already been detected by the traders and agents interviewed in this study.

The attention of the Marine Park management needs to be drawn to this issue. Depleting marine resources in bordering Mozambique will have an impact both on Marine Park stakeholders and on Mozambicans. Impacts will be both biological and socio-economic due to the natural and social interactions between the two areas. Thus controlling resources use inside the Park may not be sufficient for achieving sustainable use of Marine Park resources as the area south of the border is naturally part of the buffer zone and the political border is effectively artificial. This transfrontier aspect of resource use and dependence will be an important issue to deal with when the process for a transfrontier MPA with Mozambique is initiated (King, pers. Comm.).

6.1.2 Community relations and Park Management

Without community support, it will be difficult for the Park to achieve its objectives, both from a biodiversity conservation and socio-economic perspective. This is made obvious for example by the violent refusal of Nalingu, one of the Marine Parks' largest fishing villages, to be involved in Marine Park activities or abide by the Park's rules. No information could be gathered on this village for this study.

Although no strong conflicts were detected between Marine Park stakeholder groups in this study, a general resentment against the Park was expressed by most user groups. It was found that miscommunication, misinformation, ill informed rumours as well as the approach taken initially to stop beach seining were the source of this resentment. Resource users' fear for their livelihoods and lack of information on the Marine Park's intentions may prevent communities' to participate and support the Marine Park. These findings suggest that it would be worth the Marine Park increasing efforts in communication, education and awareness on the Park's objectives so that rumours are nipped in the bud and stakeholders reassured. A community based planning process will be a large step towards increasing communities' participation and informing them of the Marine Park's intentions.

Furthermore, efforts in developing communities' knowledge of marine ecological processes as was done in Comoros before establishing the Moheli Marine Park (Malleret, 2004), may contribute to increase communities' capacity to manage marine resources, make informed decisions and understand better the aims and objectives of having a Marine Park.

6.1.3 On integrating management

This study suggests that marine resources in the MBREMP are affected by a wide spectrum of aspects which, if the Marine Park is to achieve its goals of protecting marine biodiversity and achieving sustainable use of resources, will have to take into consideration in its planning and enforcement processes. The Marine Park resources are subjected to global/international, national, regional and local influences. Although the Marine Park will not have the power to impact all these sources of influence, it is necessary that the Park is aware of their diversity.

6.1.3.1 A broad spectrum of stakeholders and a complex network of influences

MBREMP marine resources are the basis of livelihoods for fishers, local traders, agents, and exporters. These 'users' respond to local (e.g. fresh fish, dried fish, shell meat), regional/national (e.g. dried fish) or international demand (e.g. sea cucumber, octopus, shells and opercula). The demand for MBREMP marine resources is guided by basic food needs (e.g. local and national markets), and by more complex needs in international markets based on aesthetics (e.g. use of ornamental shells), taste (e.g. octopus consumption in Europe), and culture and religion (e.g. consumption of sea cucumbers, shark fin, swim bladders in Asia, use of shell opercula in the Arab, Hebraic, and Indian worlds).

Stakeholders who affect marine resource uses are thus located in a variety of places, including the Marine Park itself, Mtwara, Dar es Salaam, Asia, Europe and so on. In order for the Park to control and steer resource uses in the Park, it will be of critical importance for the Marine Park to work in partnership with the whole spectrum of most directly involved stakeholders (e.g. from the fishers, traders, agents exporters whether they are based locally, in Mtwara or in Dar es Salaam) and raise their awareness on the impacts of their activities on the local Marine Park environment. It is also important for these stakeholders to understand that their activities will be impacted by the Marine Park's management decisions. By working in partnership both the Marine Park and these stakeholders will have significant control on how and how much of the marine resources are extracted. In addition, such partnerships can potentially contribute to influencing international consumer tastes away from marine products that are biologically threatened in the region (sharks, rays, certain shell species, certain sea cucumber species…).

Similarly, the Mozambique issue needs to be taken into account. This study shows that many Marine Park stakeholders are also stakeholders of Mozambican marine resources. It thus may be important to involve Mozambican fishers, local government, and other similar marine resource related groups in the Marine Park planning process so as to combine efforts on both sides of the borders to achieve sustainable use of the resources that are not bounded by the political boundary.

6.1.3.2 Seasonality and the impact of non-marine based activities

The level of supply of marine products is affected, for example, by the status of marine resources, by seasons, by local conditions in response to demand, which in turn affect prices, and which in turn will affects stakeholders' behaviour. Prices also vary according to the quality and type of products.

MBREMP marine resource exploitation is also affected by non-marine based activities that affect the demand for marine products. Indeed, one of the main influences mentioned by traders was the increase in local purchasing power during the cashew and rice harvest seasons, which result in an increase in demand for fish, and a consequent increase in fish prices. This event also triggers a seasonal fish trading activity, particularly for women. Furthermore, this is also when peak numbers of outside traders operate in the Park and when local traders go inland to sell their products. Some fishers mentioned that they reduce their fishing activities during peak farming seasons, and others have mentioned increasing their fishing activity in order to respond to the increased demand.

Understanding this is of high importance for Park management because it may challenge the assumption that if income from a household's non-marine based activities increases, there may be a decrease in marine resources use, and eventually the pressure on marine resources may reduce. This study suggests that the contrary may be the case due to increases in purchasing power and the high demand for marine products.

6.2 Recommendations for monitoring

On the basis of the socio-economic assessment findings and on the basis of the regional experience in socio-economic monitoring by CORDIO SEMP accumulated in the recent years, the following monitoring process is suggested. The General Management Plan review process and the donor funding support to the Park until at least 2006 are also taken into consideration in the monitoring schedule proposed.

Parameters to monitor will fall into six categories: occupational structure of the Park communities, resource-use patterns, well being, attitudes, trade and prices.

The aim of the monitoring will help the Park management to:

- Identify trends relating to the pressure on marine resources
- Determine the impact of the MBREMP on Park communities
- Adapt management based on information from monitoring
- Ensure the sustainability of the conservation process

Although regular monitoring will provide key information on the Park communities, it will not provide in-depth information on the processes that trigger the changes detected. Reasons for changes will have to be investigated through specific in-depth research.

It is important to note that the baseline assessment was very comprehensive and some information to monitor could not be determined prior to carrying out this assessment. Recommendations for monitoring are thus more specific and targeted than the data that was collected in the socio-economic assessment. Time and financial constraints are also taken into consideration. Some information appeared important in the light of this socio-economic baseline assessment and thus appears as core to monitoring whereas it may not have been central to this report.

6.2.1 Occupational structure

6.2.1.1 Why monitor the MBREMP communities' occupational structure?

The occupational structure of a community shows the diversity of livelihood activities in a community and the proportion of households involved in these livelihood activities, whether carried out for income or subsistence. From the point of view of the Park, the most important information that the occupational structure of MBREMP communities can give is an idea of the dependence on marine resources (fishing, marine products trading) at the community and Marine Park levels. By monitoring the communities' occupational structure, the MBREMP will be able to determine whether the pressure on marine resources is likely to increase (e.g. an increased proportion of households depend on fishing) or decrease. Another key aspect which will be measured by the occupational structure is the uptake of MBREMP 'AIGs' when these are established, and their potential for reducing pressure on marine resources.

6.2.1.2 Which communities and what information needs to be monitored?

It emerges from this socio-economic baseline assessment that Mkubiru, Msimbati, Tangazo and Mngoji are the most marine resource dependent MBREMP communities. It is suspected that Nalingu is as highly dependent. These communities represent the core threat areas to marine resources. Information on these communities' dependence on marine resources will thus be critical for the MBREMP to determine its success in reducing pressure on resources. The suggestion is thus to concentrate on monitoring the occupational structure of these four communities (Mkubiru, Msimbati, Tangazo and Mngoji, and when it becomes possible, Nalingu), and focus on getting information on:

- Fishing
- Trading of marine products
- Sea weed farming
- 'AIGs' when these have been established.

In this first baseline assessment all activities were investigated, these may be investigated on a less frequent basis.

6.2.1.3 Method

Methods to collect information on communities' occupational structure is described in this report and in the training notes provided (see Appendix 2). Key informant interviews are used at the quarter level in the largest villages. These informants are selected based on their good knowledge of their neighbourhood, and include men and women. Informants are asked to go through the households of their quarter (mentally) and for each of the households list activities carried out by the households (whether for income or for subsistence) throughout the year. The occupational structure established for this report has provided a list of households of the MBREMP, this list will be used and the informants would have to update the information on each household's activity. This will accelerate the process.

Prompting will be used in order to:

- Ensure that fishing, fish trading, seaweed farming and AIGs are not forgotten.
- Ensure that Seasonal activities are not forgotten
- Ensure that Women's activities are not left out
- Get further information on which marine products are traded (fresh fish, dried fish, fried fish, sea cucumbers, octopus, prawns etc.).
- Ensure that fishers selling their fish to traders are not included in traders.
- Which AIG is carried out, if any.

The information will be entered in the MBREMP data base, grouping the activities according to the categories determined in this report. The only detailed categories will be marine product trading and AIGs.

The analysis will provide information on the percentage of households involved in each village in fishing, trading of various marine products, AIGs, sea weed farming, and marine resource dependence (including fishing, marine resource trading and seaweed farming). If desired other information may be obtained.

6.2.1.4 How frequently should the occupational structure be monitored?

The occupational structure information is invaluable but data intensive. It is thus recommended that this be monitored every 3 to 4 years for the four most dependent communities, or when AIGs are established. An occupational structure of all the Park communities may be done every 10 years so that changes in other communities are detected.

6.2.1.5 Who contributes to monitoring the occupational structure of the MBREMP?

The suggestion would be that the data collection is coordinated by the MBREMP, and community key informants. Data entry is a labour intensive exercise, it is suggested that external data enterers are used

as well as MBREMP staff. The analysis can be done at the MBREMP level, simple queries such as what percentage of the communities depend on marine resources? can be pre-determined in the data base. MBREMP will benefit from support from CORDIO for this monitoring exercise on a needs basis. Support will be provided by CORDIO on a needs basis.

6.2.2 Communities' attitudes towards MBREMP

6.2.2.1 Why monitor communities' attitudes towards MBREMP?

A good relationship between the MBREMP and communities within the Park is essential for the MBREMP to achieve its objectives, ensuring participation of the communities and the sustainability of management. By monitoring communities' attitudes and perception of the Park, MBREMP will be able to react to negative attitudes rapidly and take into consideration communities' concerns. Often negative attitudes are based on misunderstanding. This needs to be avoided.

6.2.2.2 Which communities, how frequently and what information needs to be monitored?

Attitudes may change fast, it is thus suggested to monitor this on a yearly basis in all communities. This is a short exercise which can be done at the same time as monitoring resource use patterns where monitored.

It is suggested to focus on two aspects when monitoring attitudes:

- How do the communities' perceive the Marine Park, and why
- Understanding of the Marine Park's activities and objectives.

Attitudes were monitored differently in the socio-economic baseline assessment, however examples of questions to ask may be:

- What did the Marine Park do this year? What else?
- How did this affect your activity? Why?
- Is the Park a positive or negative/positive/neutral influence for your activity and why?

6.2.2.3 Method

Focus groups are most appropriate to monitor attitudes of user groups towards the Park. For communities where use patterns will be monitored on a regular basis, questions will be asked during the use pattern focus groups. These groups, as presented in this report and in the training notes (Appendix 3) are user based (e.g. fishers according to gear or species - sea cucumber and shells, traders according to the marine products traded etc).

For communities where use patterns will not be monitored yearly, focus groups will have to be established. It is suggested that fishers' focus groups according to gear (e.g. nets including large mesh and small mesh size, '*tandilo*', other methods including sea cucumber, shells), and trading (fresh fish dried fish, other products) are established. Informants may be selected randomly from the occupational structure list or purposively selected at landing sites. However, it is essential to ensure that in the focus groups (4 to 10 individuals) a variety of gender when appropriate and ages are represented as specified in the methods described in this report.

Results will be coded and entered in the data base. The analysis will be qualitative and show which user groups or village, have a better understanding of the MBREMP activities, which groups (whether users or villages) express a dislike of the MBREMP and the reasons for this.

6.2.2.4 Who contributes to monitoring MBREMP communities' attitudes?

It is suggested that the data is collected by the Park community conservation officers when collected separately from use pattern information. This will enable them to have direct feed back from key stakeholders. Data will not be lengthy to enter and could be entered by the MBREMP staff. The data collected in this report was more comprehensive and thus interview guides for attitudes may have to be redesigned with the support of CORDIO or another regional institution with strong socio-economic knowledge. Similarly coding should be developed on the basis of the results, with assistance from such an institution for the first monitoring exercise.

Analysis can be done at the MBREMP level, using the database. Simple analysis can show the frequency of different attitudes and the level of understanding of the different groups or communities. Queries to the data based will be pre determined with assistance if needed from the expert institution and potentially the data base specialists.

6.2.3 Monitoring resource-use patterns

6.2.3.1 Why monitor resource-use patterns?

As stated in this report, marine resource use patterns relate to who and how many use the resources, how, where and when these resources are exploited and which resource are targeted. Monitoring this will help the Park detect changes in methods, location, timing and numbers of people using the resources. This will give information on the likely decrease or increase in pressure on resources, and adaptive strategies of fishers for example. Changes in preferred fishing grounds may reflect the recovery of the resources in some areas, the Park may also detect the changes in the importance of Mozambique to Marine Park fishers and traders.

Changes in the perceived resource status can also be detected. It is suggested that some items of the resource use patterns are monitored more frequently than others (see below).

6.2.3.2 Which communities and what to monitor and how frequently?

It is suggested that the monitoring focus on:

- **Who (according to season)**
  → Numbers and gender of fishers and traders (e.g. fishers per gear, traders per marine products),
  → Origin of fishers and traders operating in the Park (i.e. Park villagers, outsiders).
- **Location (according to season)**
  → For fishers: - most used fishing grounds in relation to the number of fishers operating there,
  - preferred fishing grounds and why,
  → For traders: - where they buy their products (e.g. Local fishers, Mozambique).
  - where they sell their products (Local/Park markets, Mtwara market, inland markets, outside traders, agents, exporters etc.)
- **Species targeted (according to season)**: which are the main species caught.
- **Timing**: the peak times of the year for fishers and for traders.

Attention will be drawn to seasons. Thus all items will be monitored according to season. It is recommended that the above should be monitored **every two to three years** in the four most important fishing villages in the Park Mkubiru, Msimbati, Mngoji and Tangazo. It should be also monitored in Nalingu when this becomes possible. After external funding support to the MBREMP reduces a routine of collecting the information every **three to four years** would be recommended for the longer term.

Every five years an added aspect should be monitored:

- **Perceived Changes**: in catch (species and amount), in income in the last five years.

6.2.3.3 Method

The method suggested for monitoring resource use patterns is as described in this report and in the training notes (Appendix 3). User based focus groups (fisher groups according to gear, shell fishers, sea cucumber fishers, traders according to products) would be used, the participants would be selected randomly according to the list of households provided by the occupational structure. They could also be selected purposively ensuring that gender and age diversity is represented.

Analysis is qualitative and quantitative. Simple analysis can show changes in numbers of Park fishers and traders, as well as the number of outsiders (a ratio for example), changes in locations, peak seasons and species mostly targeted.

6.2.3.4 Who contributes to monitoring resource-use patterns?

Carrying out the focus groups (as many as 6 or 7 in each village) is time consuming, it is thus advised that a team of locally based facilitators assist the MBREMP staff in this exercise as was done for this study. The team will be provided with training and interview guides/forms designed by the MBREMP with support from CORDIO. The data can be entered by MBREMP staff or the facilitators themselves in the database according to a pre determined format.

Pre determined queries entered in the database will show the main changes per groups or villages.

6.2.4 Trade

6.2.4.1 Why monitor trade of sea cucumbers, shells and octopus?

Trading of shells, sea cucumbers, and octopus appeared as an important activity in the Park and is influenced by local markets as well as by foreign markets. Monitoring the trade in the Park and outside the Park will enable the Park to monitor where pressures on the resource come from. This may be monitored by the fisheries monitoring programme, care will be taken to harmonise the two processes if this is the case.

6.2.4.2 What to monitor, where and how frequently?

It is suggested that agents for sea cucumbers, shell and octopus should be counted **every year** and the amounts traded of each product identified. Agents should be counted in Mtwara, as well as in Msimbati, which is often where some exporters base themselves.

6.2.4.3 Method

It is suggested to do this through observation and semi structured interviews with the agents. Focus will be to try and identify what proportion of the various marine products sold comes from the Park. Prior to establishing the monitoring it would be worth visiting the agents and informing them of the process, particularly of MBREMP's interest to identify Park resources that are exported.

6.2.4.4 Who contributes to the monitoring of trade of specific products?

It is suggested that the data collection and entry is done by the MBREMP. An interview guide will have to be designed by MBREMP with support from CORDIO if required.

Simple analysis will be carried out to see the variation in trade and numbers of agents and of the proportion of trade coming from the MBREMP area. Queries will be pre determined in the database. This could require assistance from database experts.

6.2.5 Prices of fish and other marine products

6.2.5.1 Why monitor prices?

Marine Park policies of zoning activities or banning specific gear uses or specific activities may affect marine product supply. This in turn may affect fish and/or other marine products' (e.g. shell meat) prices and thus local access to animal protein. It is suggested that to be aware of this, the Marine Park monitors fish and shell prices. Similarly an increase in sea cucumber prices may attract more traders and thus put further pressure sea cucumber resources.

6.2.5.2 Which communities and what to monitor?

If possible, fish and other marine product prices should be monitored in all sea front and mangrove villages (Nalingu when possible, Mkubiru, Mngoji, Msimbati, Mitambo, Madimba, Litembe, Tangazo, and Kilambo). Fish prices per kg should be determined or average fish prices per size according to three or four categories of sizes should be monitored seasonally. Prices for shell meat, for ornamental shells, and prices per kg for different types of sea cucumbers should also be monitored. Market prices may be chosen as they would reflect prices paid by customers. However it may be more convenient to monitor fishers' prices for example if those are monitored within the context of the fisheries monitoring programme.

6.2.5.3 Method and frequency

It is suggested that depending on the fisheries monitoring programme, either fishers' prices or traders' prices are monitored, seasonally every year. If it is decided that fishers' prices are monitored, then it is suggested that market prices (if not possible for products such as sea cucumber and shells, use agents' or exporters' prices) are monitored **in all seasons (Southeast Monsoon, Northeast Monsoon, and possibly '*Matalai*' every three years**.

Methods to collect fishers' prices would be observation, and key informant interviews at fish landing sites. To collect market prices, observation and key informant interviews where fish are sold at the village level is suggested. A comprehensive list of prices should be gathered two or three times every season. Prices of shell meat should be collected at the market level. Prices of sea cucumbers, ornamental shells, opercula should be collected through interviews with agents in Mtwara.

6.2.5.4 Who contributes to the monitoring of fish and other marine products prices?

It is suggested that marine product price information should be collected and data entered in the MBREMP data base by the Marine Park staff. Seasonal and yearly trends can be calculated by the data base on the basis of pre-determined queries.

The Marine Park could benefit from support on establishing the sampling strategy for price data collection from CORDIO or the fisheries assessment team.

6.2.6 Household survey (communities' socio-economic status and household level fisheries information)

6.2.6.1 Why monitor Park communities' socio-economic status?

Monitoring the relative socio-economic status of specific groups will help the Park determine whether well being is improving or not, and whether this is due to changes in the resource base, up-take of alternative livelihood activities and so on.

6.2.6.2 Why more monitor more information on fisheries

The Park will benefit from monitoring further information on fisheries at the household level. This will provide more precise information on the dependence on fishing at the household level as well as on gear distribution.

6.2.6.3 Which communities and what to monitor?

The focus of the wealth monitoring should be on the most dependent communities on marine resources (Mkubiru, Mngoji, Msimbati and Tangazo, when possible Nalingu) as well as communities where AIGs have been developed when these are established.

It is suggested that for specified villages the monitoring focuses on:
For all households:

- Material style of Life data (as per this study) - wealth measure
- Fish and marine product consumption (per season, this was not explored in this study but could provide interesting insights on the demand and consumption of marine products at the local level)
- Households' activities ranked in order of importance with particular focus on marine associated activities and AIGs introduced.

For households involved in fishing or on the trade of marine products:

- How many fishers
- Gears and numbers of fishers per gear (including '*tandilo'* fisherwomen)
- Type of boat owned
- How many months off fishing, what reasons
- How many traders per product
- If fishing is the most important or sole activity of the household
  → Does fishing bring more, same, less income (according to season) than 5 years ago
- If trading marine products is the most important or sole activity of the household
  → Does trading bring more, same, less income (according to season) than 5 years ago?

This information will be more comprehensive and will enable the triangulation (verification) of other information collected more regularly through the monitoring of resource use patterns and occupational structure.

6.2.6.4 Method and frequency

It is suggested that a household survey is used as was done in this baseline assessment. Data will be entered in the MBREMP data base. It is suggested that this is done **every 3 to 4 years at first** to strengthen the knowledge base and inform the General Management Plan review during the Project period and to take opportunity of available funding. In the longer term this should take place **every 5 to 6 years in the longer term**. Households are selected in the villages of concern in a random way on the basis of the occupational structure household list. A new questionnaire based on the one used in this study should be designed focusing on the items specified above.

6.2.6.5 Who contributes to the monitoring of socio-economic status?

A household survey is a complex and time consuming exercise. It is thus suggested that an external team is used to assist the Park carry out the household survey and analyse it with the participation of MBREMP and community members as was done in this study.

Finally it is suggested that a comprehensive socio-economic assessment is carried out every 10 years in order to update information on all communities in the Park.

6.2.7 Proposed monitoring schedule

6.2.7.1 Monitoring cycle

Table 42: Socio-economic monitoring cycle proposed

Year / Villages	Occu. Struc.	Attitude	Use patterns	Trade	Prices*** (seasonally)	Household survey Socio-Eco status
2005		All villages	Seafront villages Tangazo	Mtwara Msimbati	Fishers' prices in Mangrove Sea front villages	
2006	Seafront villages* Tangazo				Market prices Mangrove, sea front villages and Mtwara agents	Seafront villages Tangazo
2007						
2008			Seafront villages Tangazo + changes			
2009	Seafront villages Tangazo					
2010					Market prices Mangrove, sea front villages and Mtwara agents	Seafront villages Tangazo
2011			Seafront villages Tangazo			
2012						
2013						
2014	All villages	All villages	All villages+ Changes**	Mtwara Msimbati	Fishers and market prices in all villages and Mtwara.	Selection of villages

*Seafront villages: Mkubiru, Mngoji, Msimbati and Nalingu if possible
**Changes: investigation of perceive changes in income and catch.
*** Prices: depending on whether fishers' prices or market prices are chosen as the main data to be collected, the main prices will be collected every year and the other every 3 or 4 years.

7 Concluding remarks

Apart from increasing the MBREMP's knowledge base on the social and economic context of Park communities, one of the purposes of this study was to show the diversity of aspects that have to be taken into consideration when establishing the MBREMP management plan. These aspects relate to the enormous diversity of actors in a number of locations who affect the exploitation of marine resources in the Park, the seasonality of the activities in the Park and the way in which non-marine based activities impact marine resource exploitation.

This study does not claim to provide an insight to all aspects mentioned here but it aims to provide the reader with a better understanding of the communities in the Park and of their complexity. It also provides elements to explore further in order to make informed decisions regarding resource use and marine resources.

It is important to note that getting Nalingu 'on board' will be essential to achieve the sustainable use of marine resources in the Marine Park.

Monitoring the occupational structure, resource use patterns, regional trade, well being, and prices will all contribute to help the Marine Park follow the communities' socio-economic evolution and its likely impact on the status of the marine resources. However, a regular comprehensive assessment (each decade) will be needed to grasp changes in the complexities of these communities.

8 References

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9 Appendices