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Livelihoods in an artisanal fishing community and the effect of ecotourism

By

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DECLARATION OF OWN WORK

I declare that this thesis

Livelihoods in an artisanal fishing community and the effect of ecotourism

is entirely my own work and that where any material could be construed as the work of others, it is fully cited and referenced, and/or with the appropriate acknowledgement given.

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ABSTRACT

There is a great deal of interest in the role of ecotourism for combating the dual problems of conservation and poverty alleviation in rural areas of developing countries. The theory that private ecotourism enterprises can achieve these goals is based in part on the assumption that increased benefits from ecotourism opportunities relative to old livelihoods result in economic substitution. However, few quantitative studies exist on the success of these operations in achieving these objectives, and fewer still examine the validity of this assumption.

This study combines quantitative and qualitative methods to examine the role of marine resources in the livelihoods of the local communities in order to better understand the consequences of ecotourism development for marine resource use and conservation. The analysis is conducted within a livelihoods framework.

The results indicate that fishing forms part of a diversified livelihood strategy for the majority of households. Marine resources serve a variety of functions within these livelihood strategies, from an important source of nutrition, sources of cash for subsistence, buffering roles, and balancing intrahousehold inequalities through to providing a social function and opportunities for extra cash. The resource with the most open access, the octopus fishery, is the most pressured and forms an important last resort for the most vulnerable households.

Employment by ecotourism does appear to lead to some level of economic substitution at the household level, but the extent to which this is sufficiently widespread to provide a significant conservation benefit is questionable. Economic substitution may not entirely replace marine resource use of the households concerned given its complementarity with other activities and importance as a source of nutrition. It does not appear to have led to poverty alleviation, but this may be a short-run response whilst salaries are invested in the means to generate alternative sources of income.

To maximise the potential benefit of economic substitution to poverty alleviation and conservation, structured links between the ecotourism operation and the community must be increased, designed to improve the multiplier effect of foreign investment and spending and open up more alternative sources of income to community members.

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ABBREVIATIONS

BCN	Biodiversity Conservation Network
CDBTP	Cabo Delgado Biodiversity and Tourism Project
CLO	Community Liaison Officer
CPR	Common property resource
DFID	Department for International Development
FAO	Food and Agriculture Organisation
GDP	Gross domestic product
HDI	Human development index
HH	Household
ICDP	Integrated conservation and development project
LDA	*Limitada* (Limited; Ltd)
Met	Mozambican Metical (plural; Meticais)
NGO	Non-governmental organisation
NR	Natural resource
PPT	Pro-Poor Tourism
PQLI	Physical quality of life index
PRA	Participatory rural appraisal
RRA	Rapid rural appraisal
SE	Standard error
SLA	Sustainable Livelihoods Analysis
SSI	Semi-structured interview
UN	United Nations
UNDP	United Nations Development Programme
WHO	World Health Organisation

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1. INTRODUCTION

1.1 The issue

There is a great deal of interest in the role of "ecotourism" in combating the dual problems of conservation (e.g. Kruger, 2005) and economic growth/poverty reduction (e.g. Goodwin & Robson, 2004) in rural areas of developing countries (Brandon, 1996; Wells, 1997; Wunder, 2000; Salafsky *et al.*, 2001; Kiss, 2004). The Biodiversity Conservation Network (BCN) make the hypothesis that if local communities receive sufficient benefit from enterprises (such as ecotourism) that depend on biodiversity, then they will act to counter internal (caused by stakeholders living in the area) and external (caused by outsiders) threats to that biodiversity (Salafsky *et al.*, 2001). The theory is that increased benefits relative to old livelihoods (economic substitution strategy through employment, tourist spending and multiplier effects (Wells, 1997)) (Salafsky *et al.*, 2001)) will result in protection of the resources. Others note that ecotourism is a useful way of generating substantial benefits from conservation and/or for meeting the often unmet costs of conservation or park management activities (Boo, 1992; Brandon, 1996; Balmford & Whitten, 2003) (but see Ferraro & Kiss (2002; 2003), Ferraro & Simpson (2003), Nicholls (2004) for arguments against ecotourism and other indirect methods for meeting this funding gap).

Despite this rhetoric, there is little quantitative evidence to suggest that ecotourism can achieve conservation goals. Much is anecdotal and subjective (Kiss, 2004). Salafsky *et al.* (2001) is one of the few studies to have carried out a systematic test of the hypothesis for the positive role of ecotourism in conservation, but due to the nature of funding looked primarily at Non-Governmental Organisations (NGOs) which may be less useful in establishing successful and sustainable ecotourism enterprises than the private sector (Salafsky *et al.*, 2001).

Likewise, very little quantitative work has been done on the role of ecotourism in poverty reduction and economic development (Kiss, 2004). Some work has looked at how ecotourism has benefited local people in terms of the proportion or amount of revenue from tourism returning to local communities (e.g. Lindberg & Enriquez, 1994; Wunder, 2000). These have determined that at best,

ecotourism produces modest cash benefits that are captured by only a small proportion of the community (Kiss, 2004), and reports frequently cite problems of leakages and low multiplier effects (Brandon, 1996; Wells, 1997). None have examined how changes in the economy may affect livelihoods through economic substitution, and therefore resource use, and contribute (or not) to conservation goals.

Vamizi Island, located near the border with Tanzania in the Querimbas Archipelago, Mozambique, has been "protected" from development by 30 years of civil war and its remote location. The local community is dependent on traditional activities such as artisanal fishing and limited agriculture. In 1999, the Cabo Delgado Biodiversity and Tourism Project (CDBTP) was created by a handful of foreign investors with the intention of developing an upmarket tourism lodge on Vamizi Island that would support and enable community development and conservation. Understanding the impact of this ecotourism development on local livelihoods and resource use will provide important insights for assessing and managing the effect of the operation, and other ecotourism ventures, on poverty alleviation and conservation.

1.2 This study

This study examines the contribution that fisheries make to the livelihoods of the community local to the ecotourism development, and how the development may affect these livelihoods and impact on the intensity of natural resource use. A combination of quantitative household surveys and participatory techniques are used. This study is not an attempt to measure the "success" of ecotourism; more an attempt to investigate the validity of one of the key routes that are claimed to lead to conservation.

Smith *et al* (in press) identify four different livelihood strategies that have important implications for how policy will affect households or communities. This approach provides a useful theoretical framework for analysing how ecotourism may affect the different livelihood strategies.

Although CDBTP was created in 1999, the ecotourism operation is not yet receiving guests. Activity on Vamizi Island commenced in earnest in 2002. It is

the first and only private development in the immediate area, and hence makes an interesting case study for examining how one enterprise may influence livelihoods. As tourism itself has not started on the island, it makes an interesting base-line for studying future impacts of the ecotourism operation. The relatively recent employment of some of the villagers also enables some of the effects of the change in employment status on those households to be identified.

Ecotourism has not been properly defined, but Lindberg *et al.* (1994) suggest the use of broadly accepted objectives of ecotourism to enable definition. These are; that ecotourism generates financial support for the protection and management of natural areas; it generates economic benefits for residents living near natural areas; and it generates support for conservation among these residents. Under these terms, the CBDTP is proposed as an ecotourism venture as its aims broadly include these objectives (Garnier, 2003).

1.2.1 Aims and objectives

The primary aim of this research is to investigate the role of marine resources in livelihoods of local communities on Vamizi Island in order to better understand the consequences of future ecotourism development for marine resource use and conservation.

The specific objectives are:

- To assess the livelihood strategies of households and evaluate the use of marine resources within these households
- To characterise the marine resources and users' access to them
- To evaluate the impact of ecotourism on livelihood strategies and resource use and identify mechanisms for helping ecotourism achieve its objectives.

The main thesis of this study is that the generation of employment through ecotourism reduces dependence and pressure on marine resources.

1.3 Project rationale

Combating and eradicating poverty is a key objective of the international community as illustrated by the UN Millennium Declaration (UNDP, 2005).

Poverty is widespread through small-scale fishing communities in developing countries leading to the common belief that 'fishery rhymes with poverty' (Béné, 2003) ever since Gordon's (1954) seminal paper on the fishery as a common property resource (Thorpe *et al.*, 2004).

The fisheries sector has been growing very rapidly with 120 million people estimated to be partly or totally dependent on fisheries related activities by 1990, 95% of which are in developing countries (Food and Agriculture Organisation (FAO), 2005). This rapid growth has led to fears of a world-wide fisheries crisis (McGoodwin, 1990), and tropical fisheries are no exception (McManus, 1997). The degradation of marine resources in East Africa has caused concern for people's livelihoods (Payet & Obura, 2004). Growing domestic demand for fish in East Africa, linked in part to rapid population growth, has led to a depletion of resources in many areas, and it is estimated that coastal fisheries in many of the Eastern African countries are nearly or fully exploited (Ngoile & Linden, 1997). This has caused particular concern for the food security of the poorest people as prices are pushed up and supply per person falls (Kent, 1997; Malleret-King, 2000; Pauly *et al.*, 2005).

The response to the problems of poverty and resource degradation have most frequently been to make small-scale fisheries more economically efficient through mechanisms including improved processing and storage techniques and improved access to markets (e.g. FAO, 2003; Thorpe *et al.*, 2004), whilst attempting to conserve fish stocks through a combination of management to limit access and incentives for fishers to leave the fishery (Allison & Ellis, 2001). However, these approaches have often failed to protect resources from degradation because, amongst other reasons, a limited sectoral approach is taken that disregards the livelihoods of small-scale fishermen (van Oostenbrugge *et al.*, 2004) and the wider coastal economy (Allison & Ellis, 2001).

There are few studies in the published literature on the nature, extent, causes or dynamics of poverty in fisheries or how fisheries contributes to poverty alleviation and food, and most of those have been written since 2000 (Macfadyen & Corcoran, 2002; Béné, 2003). Many studies previous to this

emphasised the resource dependence of small-scale fishers and the open-access nature of the resource that leads to degradation (Allison & Ellis, 2001), characterising fishermen as the 'poorest of the poor' (Béné, 2003), and assuming they are specialised (van Oostenbrugge *et al.*, 2004). However, there is little empirical evidence to support this, and the few quantitative studies there have been have produced somewhat contradictory findings (Thorpe *et al.*, 2004). Poverty came onto the agenda of resource managers (such as FAO) as a result of the indications that there are links, although complex, between poverty and the degradation of natural resources (Reardon & Vosti, 1995) and the FAO Advisory Committee on Fisheries Research recently recommended further research into poverty and fisheries (Thorpe *et al.*, 2004).

Without the knowledge of the role of fisheries in poverty and the interaction between the two, it is difficult to assess how successful initiatives such as ecotourism development and other economic incentives for fishermen to leave fisheries will be in reducing the pressure on marine resources. The theory that economic substitution will reduce pressure on fishing resources assumes that fishing provides the primary source of income for poor households, and that when another source of income replaces this, they will have less need for the fishery.

This case study will therefore be of interest in the context of poverty and fisheries, and the role of ecotourism in conservation and economic development.

2. LITERATURE REVIEW

This chapter first examines the literature on fisheries and poverty to see how it can contribute to the understanding of the role fisheries may play in poor peoples' livelihoods and how it can help to understand the determinants of fishing and livelihood outcomes. This information is of great importance in understanding how ecotourism may affect the role of fisheries. Following this, the literature on ecotourism is examined to determine what ecotourism is and what its advantages and disadvantages are.

2.1 Fisheries and poverty

'Many communities of fishermen are poor but it should be realised that they are not necessarily poor because their livelihood is fishing. They are often already poor and landless individuals who are able to subsist by fishing.'

(Dunn (1989), cited in Béné *et al.* (2000))

2.1.1 'The old paradigm' (Béné, 2003)

Until recently, fisheries have been largely ignored in the current literature on poverty (Béné, 2003). For example, a review of the role of common property resources in poor people's livelihoods (Beck & Nesmith, 2001) only contained one case study of fisheries. However, fisheries literature abounds with statements that fishing communities belong to the poorest of the poor (Macfadyen & Corcoran, 2002). Béné (2003) demonstrates that empirical studies on fisheries are heavily influenced by the 'old paradigm'. This stereotype, that 'fisheries = poverty' (Béné, 2003), often represents some important truths, but it is insufficient to be a useful transferable model for understanding the outcome of fisheries and of those actors participating in it (Smith *et al.*, in press).

Béné (2003) describes two pillars of support for the old paradigm, summarised in figure 2.1.

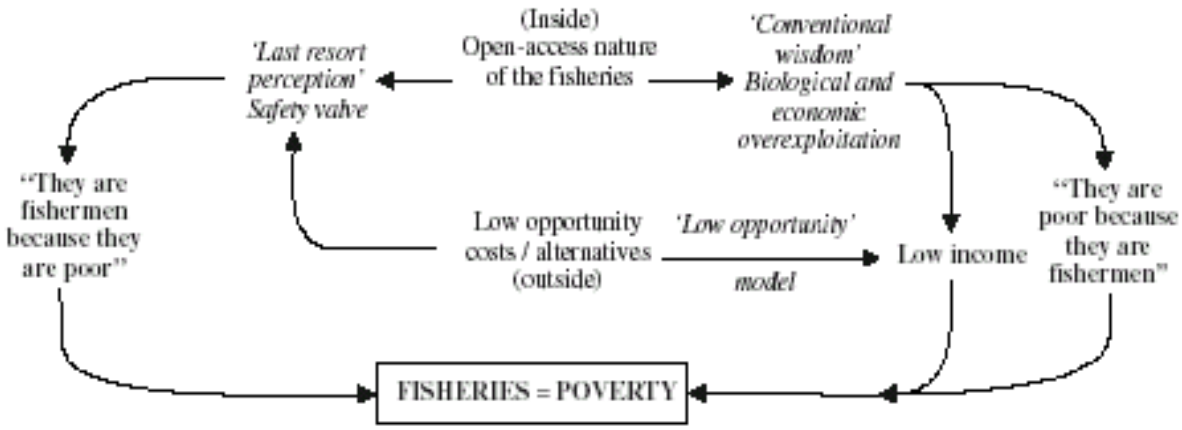

Figure 2.1 The two pillars ("they are fishermen because they are poor" and "they are poor because they are fishermen") supporting the circular conventional wisdom that fisheries = poverty. Reproduced from Béné (2003).

The first pillar, "they are poor because they are fishermen", is explained as the 'endogenous' (Béné, 2003) origin of poverty in fisheries. It emerged with Gordon's (1954) seminal paper on the fishery as a common property resource (CPR) explaining the dual problems of low income and over-fishing in a fishing community (Macfadyen & Corcoran, 2002). It proposes that because fisheries are often seen as a type of CPR having open access characteristics, more and more people are able to enter the fishery leading to economic, and possibly biological, overexploitation, eroding profitability and impoverishing the fishing community (Smith *et al.*, in press).

The second pillar, "they are fishermen because they are poor", is explained as the 'exogenous' origin of poverty in fisheries. It is related to low opportunity incomes in the surrounding economy and high labour mobility, both of which are particularly applicable in the developing world given that most small-scale fisheries are located in remote rural areas with few employment alternatives (Béné, 2003). Cunningham (1993) shows, using a simple two-sector model, that even if a fishery only generates short-term profits, there will be pressure to enter the fishery until there is long-term wage re-equilibrium between the two sectors, given the assumptions of open-access and perfect labour mobility. A further complication may be that the opportunity costs of fishing are actually lower than the opportunity costs of other activities, maybe because it is easier to enter a fishery than to leave. Reasons for this may include: isolation of the

fishing community leading to limited education levels, infrastructure links and alternative employment opportunities; the high-liner illusion (the possibility/expectation of a windfall catch); the time-lag required to adjust labour requirements to productivity gains; investment in specific assets which lose market value as the fishery declines; lifestyle preferences, and cultural factors (Macfadyen & Corcoran, 2002; Smith *et al.*, in press).

Béné (2003) also includes a 'distributive dimension' of fisheries: that the fishery provides an economic safety valve or livelihood of last resort for the poor. This strengthens the view that fishers are "poor because they are fishers", and requires a fishery to be open access to those without alternative means of support (Smith *et al.*, in press).

2.1.2 Changing dimensions of poverty

The view of poverty in fisheries is changing from the old paradigm for two reasons. Firstly, it has only been relatively recently that the issue of poverty and poverty reduction has become an explicit objective in resource management (for example in the case of FAO (Reardon & Vosti, 1995)) (Macfadyen & Corcoran, 2002) and in recent years the international community commitment to tackling poverty has reached an all-time high (Hulme & Shepherd, 2003). Secondly, the understanding of poverty has changed, including the way it is measured (Macfadyen & Corcoran, 2002; Béné, 2003). Figure 2.2 demonstrates how indicators of poverty have changed from simple nutritional inputs through to a more holistic, multidimensional and complex approach of well-being and sustainable livelihoods analysis (SLA).

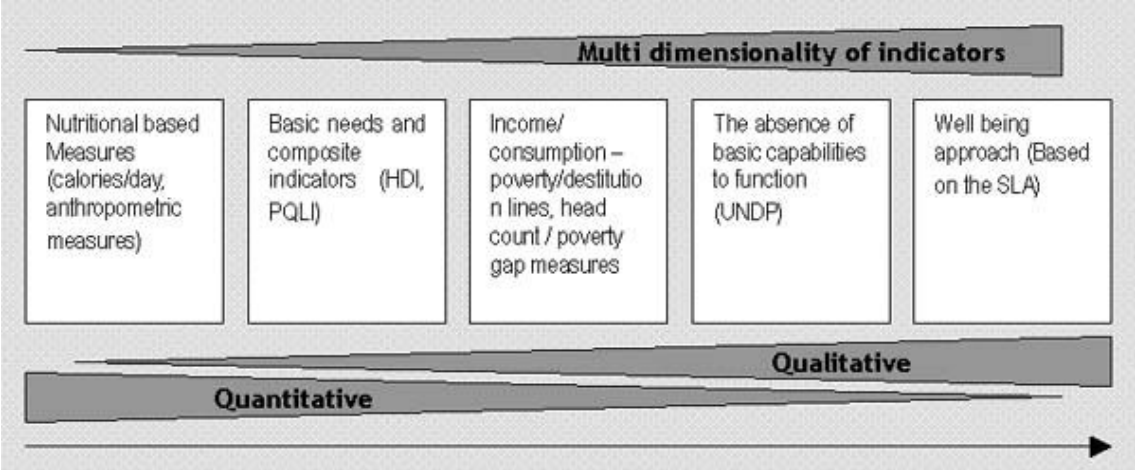

Figure 2.2. The evolution of indicators of poverty to a more holistic understanding. Reproduced from Macfadyen & Corcoran (2002) (HDI=human development index, PQLI=physical quality of life index, UNDP=United Nations Development Programme, SLA=sustainable livelihoods analysis)

This evolution in indicators is partly due to the use of participatory experiences and the recognition that nutrition and income are not sufficient measures of well-being. Participatory techniques have shown that poor people often explain poverty in terms of assets or access to resources rather than income, some of which are quite intangible and difficult to quantify (Macfadyen & Corcoran, 2002). Narayan *et al.* (2000), cited in Macfadyen & Corcoran (2002) report 5 key elements that contribute to the concept of poverty according to the poor:

- Poverty is multidimensional and complex
- It is a lack of assets required for well-being
- It includes psychological aspects
- It is an absence of basic infrastructure
- It focuses on assets and vulnerability to risk, not income

Incorporation of this new research on poverty helps to identify that it is not just a function of the resource itself that makes fishers poor. Rather, socio-institutional mechanisms governing people's access to resources play a critical role in vulnerability to poverty (Béné, 2003). In terms of the livelihoods of people dependent on fisheries resources, a lack of the necessary resources and opportunities to meet basic needs to make a viable livelihood may contribute to their poverty (Smith *et al.*, in press). 'Entitlement failure' (Sen, 1981) can make people liable to poverty following shocks or illness, noting that poverty is dynamic (Sen, 2003; Smith *et al.*, in press). But poverty can also be

seen in terms of lack of access to goods and services or a deprivation of economic, political, social and cultural rights (Smith *et al.*, in press).

The consequence of this for fisheries is the recognition that "poor fishing communities" are actually composed of different strata of poor people who use fishery resources in different ways. It is no longer useful to classify whole communities as "poor", as different strata within the society will respond differently to policies and mechanisms to reduce poverty in these communities (Béné, 2003). It is therefore necessary to examine the nature, causes and extent of poverty more closely, and to develop some sort of framework to do so. The concept of livelihoods is one such framework.

2.1.3 Livelihoods analysis

In addition to changes in the understanding of the nature and causes of poverty, it is now widely recognised that individuals or families may employ a wide range of strategies to survive and provide for themselves. These strategies may be adapted in response to resource fluctuations and other shocks, crises and uncertainties; the poorest being those less able to withstand these shocks (Allison & Ellis, 2001; Macfadyen & Corcoran, 2002; van Oostenbrugge *et al.*, 2004). The concept of livelihoods in the literature allows for the multidimensionality of poverty and recognises that livelihood strategies may be composed of many components rather than just one. The Department for International Development (DFID, 1999) define a livelihood as 'the capabilities, assets (including both material and social resources) and activities required for a means of living'. Livelihoods analysis is typically set out in a framework that brings together the main components that are thought to comply with the livelihoods definition (e.g. Allison & Ellis, 2001).

Livelihoods analysis recognises that the capacity to resist poverty and to improve livelihoods often depends on the opportunities offered by natural resource based production systems as influenced by the wider economic, institutional and political environment (Smith *et al.*, in press). Much of it centres on the assets of rural people and on how different patterns of asset holding can make big differences to the ability of families to withstand shock. It links in with the concept of vulnerability, borrowed from the ecological literature on

sustainability, resilience and sensitivity. The unit of livelihoods analysis is normally focussed at the household level (Allison & Ellis, 2001).

Smith *et al*. (in press) use this information to provide a useful framework for explaining the activity and livelihood outcomes for inland fisheries. In their framework, 'situational variables' such as the micro, meso and macro economic environment, fisher and fishery characteristics and the institutional environment interact with factors such as opportunity costs, the degree of open access to the fishery, the level of biological and economic exploitation, and the livelihood strategy employed by the household to explain the environmental sustainability of the fishery and the household income derived from fishing. The authors identify four possible livelihood strategies, summarised in table 2.1. Labour opportunity costs and the nature of access to the resource (how 'open' it is) from the 'old paradigm' remain important determinants of overall resource use, but are analysed both within the context of the physical, institutional and economic attributes that influence them, and as key influences on the role played by resource use in household livelihood strategies (Smith *et al.*, in press). Details of the framework are summarised in figure 2.3.

Livelihood strategy	Livelihood functions of fishing
'Survival' (fishing is sole activity)	▪ Subsistence (food production and income) ▪ Nutrition – protein, micronutrients and vitamins
'Semi-subsistence diversification' (fishing is one of a range of activities, e.g. farming)	▪ Own consumption – food security and nutrition ▪ Complementarities in labour use with farming ▪ Means for barter, or for participation in reciprocal exchange and social networks ▪ Occasional cash source ▪ Diversification for; labour and consumption smoothing; risk reduction; as a coping strategy/buffering against shocks
'Specialisation' (fishing as sole activity, but a lot more resources are invested to ensure maximum returns possible)	▪ Market production and income ▪ Accumulation
'Diversification for accumulation' (fishing is one activity in a portfolio of activities that produce surplus to subsistence requirements)	▪ Accumulation ▪ Retention in a diversified accumulation strategy ▪ Recreation

Table 2.1. The role of fishing in different livelihood strategies, and the function of fishing within these strategies. Adapted from Smith *et al.* (in press)

Using this framework, Smith *et al*. (in press) point out how the 'old paradigm' of fisheries and poverty is insufficient to explain the role of fisheries in livelihoods and the outcomes. Smith *et* al. (in press) provide a comprehensive discussion of all the possibilities, but only those relevant to this study will be covered here. Most importantly in the context of this study, the livelihoods approach recognises that the mobility of households between fishing and other activities is not necessarily a substitution between full-time occupations (Allison & Ellis, 2001). Households may allocate labour time to fishing for a variety of reasons other than just because they have low opportunity costs or as a 'last resort'. Studies have highlighted that fishing (and other livelihoods in other CPRs previously thought to be of main importance to the poorest groups of society (e.g. de Merode *et al.*, 2004)) can be a more important activity of households who have higher incomes and living standards than the poorest groups (although they may still be poor) (Allison & Ellis, 2001; Smith *et al.*, in press). They may also fish for traditional or cultural reasons.

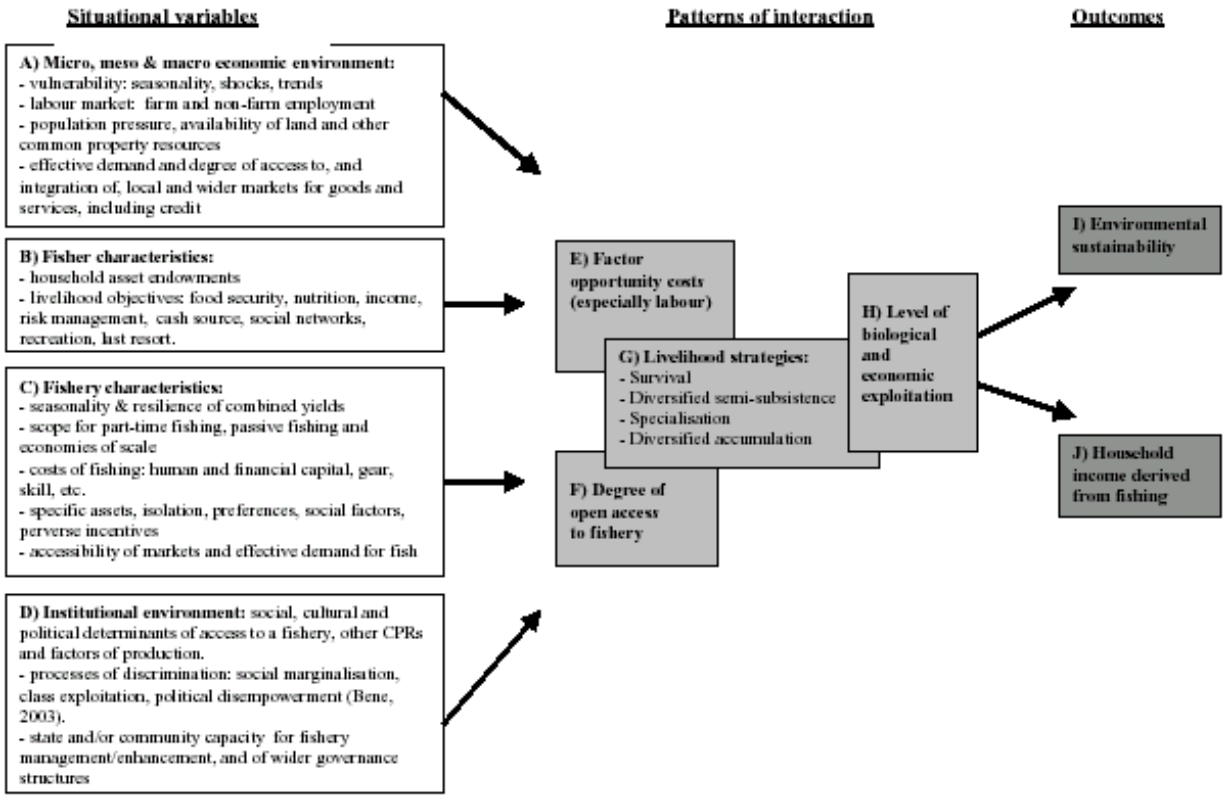

Figure 2.3. A framework for understanding the determinants of livelihood outcomes in a fishery. Reproduced from Smith *et al*. (in press)

An important aspect is the 'openness' of the fishery. Even without institutional restrictions on fishing effort or gear, there exist practical barriers to entry to fishing in terms of the gear, knowledge and skill requirements. Although these costs are very low in developing countries, what is affordable is relative to income or the ability to access credit (Smith *et al.*, in press). This kind of 'economic exclusion' (Béné, 2003) means that some of the most rewarding methods or locations can be permanently beyond reach of the poorest (Smith *et al.*, in press). Increased income to a household (e.g. through employment) may encourage investment in more or improved fishing gear; either for use by other household members, during time-off, or for employing staff. This may drastically change the way a resource is used in the household, moving away from a diversified or specialist ('survival') *subsistence* livelihood into part of a diversified *accumulation* strategy (Smith *et al.*, in press), which also has implications for the resource.

Also, an absence of reliable markets where households can purchase affordable food may lead to households tending to prioritise labour use in subsistence activities such as fishing for their own consumption, despite the fact

that opportunity costs are high, so these subsistence activities continue on top of other employment (Poulton *et al.*, 2001; Smith *et al.*, in press). Further to this, Poulton *et al*. (2001) report that there is some evidence that money made by men outside of their subsistence activity is actually spent on consumer durables and alcohol rather than going back into the household. This suggests that the subsistence activities of other household members (as all or part of the subsistence production of one member is effectively removed) become more important (maybe leading to increased pressure on these resources if activities are segregated as is often the case in developing countries), and the actual welfare of some households, or members of those households, may fall.

2.2 Ecotourism

2.2.1 The broader picture

'Tourism is the world's fastest growing industry' (Goodwin, 1998). According to the World Travel and Tourism Council, international tourism generated about 10% of GDP in 1994 and accounted for over 10% of all consumer spending. It also created more than 12 million new jobs and provided US$650 billion in tax revenues to governments (Wells, 1997). The industry is expected to continue to grow at 4-5% per annum (Goodwin, 1998), and had a growth of 9% in 1990 (Isaacs, 2000). Since the 1950s developing countries have been receiving increasing numbers of international visits (Goodwin, 1998).

Partly owing to a lack of consensus on the definition (Boo, 1992; Brandon, 1996; Goodwin, 1996; Kruger, 2005), there are no reliable estimates for the global expenditure on ecotourism. Depending on the definitions used, estimates range from a conservative 10-15% of total travel expenditure to as high as 30% in the mid-1990s (Brandon, 1996), and it was expected to grow rapidly for the ensuing 20 years (Goodwin, 1996).

Addressing the twin problems of biodiversity conservation and economic development are amongst the most challenging tasks facing mankind (Wilson, 1992; Myers *et al.*, 2000). Integrated Conservation and Development Projects (ICDPs) have developed in response to these needs (Wells & Brandon, 1992; Salafsky & Margoluis, 1999). They are an indirect approach to achieving conservation goals, labelled by some authors as 'conservation by distraction'

(Ferraro & Kiss, 2002; Nicholls, 2004), as well as a means for attempting to 'bridge' the funding gap (Balmford & Whitten, 2003) for protected areas (Wells & Brandon, 1992), and have become particularly popular in developing countries (Ferraro & Kiss, 2002). It is often assumed that ICDPs will result in conservation of the natural resources in question whilst also leading to increased benefits for local communities who may have forgone more environmentally damaging development activities (Naidoo & Adamowicz, 2005) by linking conservation and livelihoods (Salafsky & Wollenberg, 2000).

Ecotourism and/or nature-based tourism is often a key component of ICDPs in developing countries (Bookbinder *et al.*, 1998; Naidoo & Adamowicz, 2005). First seen in the English-speaking academic literature in 1985 (Weaver, 2005), it has become one of the hottest buzzwords in conservation (Aylward *et al.*, 1996). The rise in its popularity can largely be attributed to the rise in the concept of "sustainability" (Kruger, 2005) popularised by the Brundtland Report (WCED, 1987). It offers the potential for mobilizing resources from the private sector to contribute to local and national economic development, whilst providing an economic incentive for conservation land uses and financing conservation activities (Wells, 1997). This is a very attractive option, particularly in remote rural areas of the developing world where economic alternatives are few, biodiversity investments inadequate, and public funds scarce (Wells, 1997).

However, despite the rhetoric of ecotourism and ICDPs, there have been very few quantitative studies of their success in achieving either conservation or development objectives (Lindberg & Enriquez, 1994; Brandon, 1996; Ferraro & Simpson, 2003; Kiss, 2004), and those there have been have shown mixed results in both objectives (Salafsky *et al.*, 2001; Balmford *et al.*, 2002).

2.2.2 The definition of ecotourism

Although many have attempted to define ecotourism, there is still no accepted standard (Carrier & Macleod, 2005). Carrier & Macleod (2005) argue that due to this and the commercially valuable association with the term, more and more tourist facilities are applying the term to themselves. Definitions range from being *a hotel that is situated in a natural area* through to *travel to relatively*

undisturbed or uncontaminated natural areas with the specific objective of studying, admiring and enjoying the scenery and its wild plants and animals along with any cultural manifestations found in those areas (both cited in Kruger, 2005). Boo (1992) defines it as 'nature travel that advances conservation and sustainable development efforts', and it seems widely accepted to be a subset of nature tourism (Brandon, 1996). Lindberg *et al.* (1994) suggest the use of broadly accepted objectives of ecotourism to enable definition. These are; that ecotourism generates financial support for the protection and management of natural areas; it generates economic benefits for residents living near natural areas; and it generates support for conservation among these residents. This is the definition accepted for the purposes of defining the current case study as an ecotourism venture.

However, there are two areas in the literature that are of interest to the current study. The first is how tourism (whether ecotourism or not) can contribute to development, in particular local development. The second is how tourism can contribute to conservation. Where tourism contributes to both these aspects it can be regarded as ecotourism. But to understand how it achieves each objective the literature will be examined for conservation and development separately.

2.2.3 Tourism and economic development

Tourism is of great interest at a national level for developing countries for four main economic reasons:

- The generation of foreign exchange
- The generation of employment
- Economic diversification
- Regional growth (Brandon, 1996)

There are also some non-economic national benefits associated with it such as diplomacy, international stature and peace (Brandon, 1996). However, critics point out that if economic leakages are taken into account, such as through the use of imported skills, technologies and commodities and through foreign ownership of tourism related companies, countries would have much lower tourism earnings than assumed (Brandon, 1996). The supply chain of tourism services, including suppliers, wholesalers, retailers and consumers, are mostly

owned or controlled by developed nations. The degree of leakage is emphasised by a 1970s World Bank estimate that 55% of tourist spending in developing nations leaked back into developed countries, whilst other studies suggest that leakages of 80-90% may be more common for countries lacking a substantial share of national ownership of tourism services (Brandon, 1996).

At a local level, the potential economic benefits of tourism are employment and local tourism spending. The local economy can often benefit by improved infrastructure (Goodwin & Robson, 2004). Benefits can be direct (initial tourism spending), indirect (goods or services bought to supply tourists) or induced (money spent by employees) (Lindberg, 1996).

The 'multiplier effect' is an indirect effect often invoked as a potential benefit of tourism. This occurs when the employment and industries generated by tourist spending create further employment in supporting industries. In the past studies in the Caribbean, Kenya and Tunisia had reported multiplier effects (i.e. the number of jobs in supporting industries) to be 2-3, 4 and 6 times the number of jobs in tourism respectively. However, subsequent research has shown the real figures to be much lower than this; closer to, or less than, 1 (Brandon, 1996). Tourism is believed to be less labour intensive than commonly assumed. Much of the employment generated is normally for workers with low skills as the levels of education and existing skills are low, as is their access to capital (Goodwin, 2002). However, it does provide low-skilled labourers with higher wages than they might otherwise receive (Brandon, 1996), and the employment benefits can have a great impact (e.g. Lindberg *et al.*, 1994).

Local benefits are highest where linkages to the local economy are strongest (Goodwin, 1998). Pro-Poor Tourism (PPT) is an approach to tourism development and management that ensures local poor people are able to secure economic benefits from tourism fairly and in a sustainable way. It sees three ways that tourism can benefit the livelihoods of rural poor: economic gain through employment and enterprise development as discussed above; infrastructure gains; and empowerment through engagement in decision making (Goodwin & Robson, 2004). It sees tourism as very relevant to poverty reduction in achieving the Millennium Development Goals (Ashley *et al.*, 2004).

Many of the proponents of ecotourism advocate the use of autonomous models whereby the community has ownership of the tourism, reducing leakages. However, as local capacity to supply and/or market these products is low due to inexperience, lack of access to credit and limited productive capacity, these are generally constrained to back-packer style operations, for which demand can more readily be satisfied by local production.

Luxury spending by upmarket tourists relies more on imports from outside the region and better experience. These sorts of operations are therefore, more generally owned by international companies, often based in the tourist-originating countries where they have access to the market. Leakages in these operations are highest, but the benefits generated by these operations should not be underestimated (Goodwin, 1998; Wunder, 2000; Kiss, 2004). In particular, where links are made between community groups and the private sector at the destination level, there is potential to create significant benefit for the local communities who benefit from the access to markets and expertise bought in by the private sector (Goodwin, 1998; Kiss, 2004).

Benefits can be increased through: sourcing (and training) of as much local labour as possible; local sourcing of as many goods as possible, using as much as is available and helping to generate micro-enterprises such as growing new crops required by the tourists; ensuring some degree of ownership by the local communities, of land (for example) rather than it just being allocated at the national level; and providing access of the local communities to tourists for sales of memorabilia, rather than allowing enclaves and bypasses such as hotels where tourists rarely encounter local communities as they are refused access (Wells, 1997; Goodwin, 1998; Walpole & Goodwin, 2000; Goodwin, 2002; Goodwin & Robson, 2004). These rural areas are also seen as having a lot to offer in terms of the nature, wilderness and culture (Wells, 1997; West & Carrier, 2004), although some argue that there is a limit to those natural areas that can run successful tourism due to the remote, dangerous, or insufficiently charismatic nature of certain areas (McClanahan, 1999; Balmford & Whitten, 2003).

However, despite the enormous potential of tourism in natural areas to contribute to local economic development, there is a significant gap between this potential and actual contribution (Wells, 1997), and few studies have quantitatively assessed the contribution (Salafsky *et al.*, 2001; Balmford *et al.*, 2002).

2.2.4 Tourism and negative effects on communities

It is important to note that there can also be negative effects of tourism. These include the realignment of cultural ideals to western ideals (West & Carrier, 2004), distributional inequalities (Walpole & Goodwin, 2000), and pushing local people out as interest in resources increases causing inflation of prices; whether land, food or commodities (Brandon, 1996; Walpole & Goodwin, 2001). These cultural and social aspects are beyond the scope of this study.

2.2.5 Tourism and conservation

In this section the literature on nature-based tourism will be considered.

Some authors see ecotourism and nature-based tourism as the panacea for conservation (e.g. Gossling, 1999), or at least having great potential to make a positive contribution (Wells & Brandon, 1992; Brandon, 1996). However, tourism does have a negative affect on the biotic and abiotic environment (Lindberg *et al.*, 2003), and the most remote sites may be the most important for biodiversity conservation as they are the least degraded (Brandon, 1996). This has lead to some claiming that tourism can only be antagonistic to conservation (Isaacs, 2000). Financial conflicts of interest may also arise between private objectives and conservation (Ferraro & Kiss, 2003). Many argue that any economic development or use of business or eco-friendly activity is incompatible with conservation goals and detracts from the intrinsic value of nature (Wells & Brandon, 1992; Oates, 1999). The success of ICDPs in general as a conservation tool is therefore debatable (Oates, 1999; Hulme & Murphree, 2001). Some argue that it strains credulity to believe that conservation advocates can better recognise profit-making opportunities (from conservation) than can investors who make their living looking for such opportunities. On this basis, they suggest the opportunity for private-led conservation must be lower than many conservationist proponents suggest (Ferraro & Simpson, 2003).

However, whilst the number of critics is far exceeded by the number of advocates, and despite the rhetoric of tourism and ICDPs in conservation, there have been very few quantitative or comparative studies examining the conservation success of these projects, and those there have been have shown mixed success (Bookbinder *et al.*, 1998; Salafsky *et al.*, 2001; Kruger, 2005). Part of the reason for this is a difficulty of measuring what is meant by success (Salafsky & Margoluis, 1999). Salafksy & Margoluis (1999) propose the use of a Threat Reduction Assessment as well as quantitative measures of conservation success. This is of interest to the present study, but the objectives are to investigate the mechanisms by which conservation and development could occur and to contribute to ways of improving this contribution, rather than looking at success per se.

The rest of this section looks at the how tourism could contribute to conservation, and examines the relevant literature.

Brandon (1996) identified 5 key benefits for conservation from nature-based tourism:

- Providing a source of financing for parks and conservation
- Providing economic justification for park protection
- Providing local people with economic justification for conservation
- Constituency-building to promote conservation
- Creating impetus for private conservation efforts

Much of the focus in the literature has been on the role tourism plays in financing parks and conservation activities. Many of these studies have actually found that the entrance fees to parks are generally too low to generate sufficient funding for park management, even though foreign tourists would be willing to pay significantly higher amounts; 10 times or more (e.g. Lindberg & Enriquez, 1994; Walpole *et al.*, 2001; Naidoo & Adamowicz, 2005). The private sector is often opposed to these price increases believing that it will decrease visitor numbers, and despite evidence to the contrary, they are a powerful lobby and have prevented increases (Lindberg & Enriquez, 1994; Walpole *et al.*, 2001). However, the capacity to reduce the dependence on external funding through suitable entrance fees is recognised given the political will to increase them (Brandon, 1996).

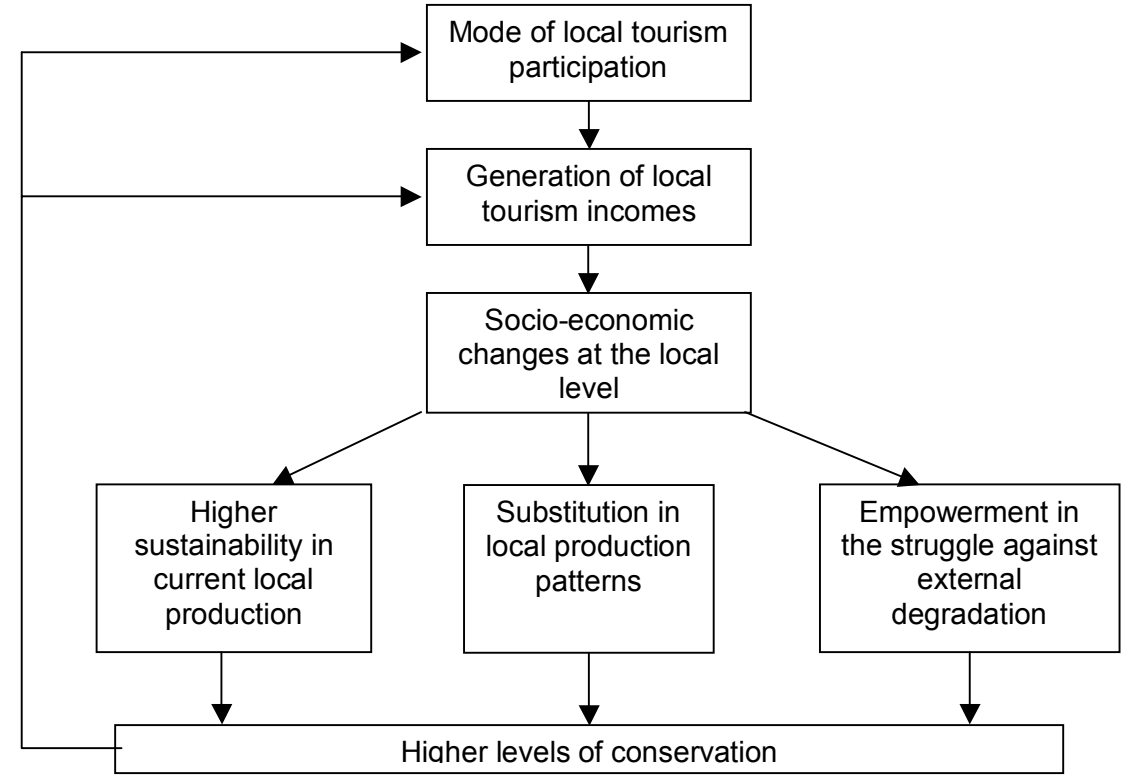

Figure 2.4 From tourism participation to conservation. Modified from Wunder (2000)

Economic valuation based on tourists willingness-to-pay is increasingly being used to justify park management to national governments (Brandon, 1996; Walpole *et al.*, 2001; Naidoo & Adamowicz, 2005). A study in Costa Rica showed the value of tropical rainforest if left natural to be twice that of the straight purchase price of the land alone, and tourism in Zimbabwe relies heavily on parks and associated wildlife populations to attract tourists (cited in Brandon, 1996).

The issue of economic justification of conservation to local people is largely covered in section 2.2.3 The most important factor is the establishment of a strong credible link between the livelihoods of the local communities and the conservation (Salafsky & Wollenberg, 2000; Wunder, 2000; Salafsky *et al.*, 2001; Kiss, 2004). Figure 2.4 demonstrates the theory of how this may occur.

Many of the proponents of ecotourism advocate the use of autonomous models to create a stronger incentive for conservation in local communities. In foreign-owned private enterprises where the main or only link to communities is through employment (salary-based models), there is no clear incentive for local communities to conserve their natural resources (Wunder, 2000), so the only

potential for altering resource use is "substitution in local production patterns". In a comparative study on three Cuyabeno groups in Ecuador, Wunder (2000) found that the mode of community participation did not affect the level of local income generation, although the inherent incentive structure in the mode of participation was important in determining changes in labour and land allocation that were important for conservation. Other studies have demonstrated that tourism can lead to a stated support for conservation (Lindberg & Enriquez, 1994; Walpole & Goodwin, 2001), although Walpole & Goodwin (2001) could not identify a positive relationship between the actual receipt of economic benefits from tourism and support for conservation. Salafsky *et al.* (2001) found that although many of the enterprises they tested did not generate high cash benefits for local people, there were other factors that determined whether there was conservation success or not (in terms of threat reduction), including education, awareness and a good relationship with project staff. Stem *et al.* (2003) found that employment in tourism in Costa Rica only minimally influenced conservation perspectives, whereas indirect benefits and education levels showed stronger associations with conservation behaviours and perspectives. These again suggest the mode of participation is more important than purely the amount of cash benefit received in determining conservation outcomes. Kiss (2004) suggests that benefits from tourism must be sufficiently high and widespread to out-compete basic livelihoods that may be biodiversity unfriendly. Aside from this sort of success being uncommon, it is also likely to attract outsiders who will both dilute the benefits and put greater pressure on local natural resources (Kiss, 2004). Also, substantial earnings may not necessarily lead to conservation support or action as they may lead to an investment of earnings into livelihood activities that increases the pressure on natural resources (Kiss, 2004). In terms of livelihoods, the possibility of this kind of diversified accumulation strategy has been discussed in section 2.1.3.

Brandon (1996) emphasises the importance of constituency building for conservation activities. On returning from their trips, ecotourists, or nature tourists, are often much more likely to support conservation activities for that specific site, or more widely, through donations or membership to organisations, as advocates (persuading their friends to go or raising awareness (Kruger,

2005)), or even as petitioners or lobbyists against policies or activities that threaten the areas they visited.

Finally, Kwazulu-Natal in South Africa is one area that demonstrates that nature tourism can make a significant contribution to conservation through providing incentives for private landholders to maintain their properties in a largely natural state for the purposes of game ranching (Lindberg *et al.*, 2003). One study even found a positive link between biodiversity and attractiveness to tourists, suggesting a positive incentive to maintain biodiversity (Naidoo & Adamowicz, 2005), although this is at odds with other studies (Bookbinder *et al.*, 1998; Isaacs, 2000).

2.2.6 Cabo Delgado Biodiversity and Tourism Project

The Mozambique Government regards tourism as a very important base for economic development, and sees one of the objectives as being the conservation of ecology and the environment (Ministério do Turismo, 1995). Much of the development at present is regarded as "high-end low impact" tourism, with the Querimbas an important centre for this development. "High-end low impact" is based on the assumption that the tourism will cater for only a few high-spending guests at a time (mostly due to the high costs involved in travelling to the location), and therefore the cultural and ecological impact of this number of guests is assumed to be less than in other tourism operations. Cabo Delgado Biodiversity and Tourism Limitada (LDA), the private company that runs the tourism side of the Cabo Delgado Biodiversity and Tourism Project (CDBTP), is an important example of one such development, with concessions on three of the largest islands in the Archipelago and a coastal concession of over 33,000ha. The central focus of activity has been on Vamizi Island, where the luxury lodge is due to open towards the end of 2005 with luxury lodges and ecotourism-based activities. The company is one of the largest employers in the area, and a bed-levy is planned to provide income for a trust fund to be used for community development and conservation programmes. They are committed to the sustainable development of the local communities and conservation of natural resources (Garnier, 2003). On Vamizi Island, the key focus is the marine resources, being the key attraction for tourists and critical to local livelihoods.

3. RESEARCH METHODS

3.1 Overview

The methodology was designed to combine both quantitative and qualitative data to meet the objectives in the limited time available. A further objective was to provide much-needed baseline data that could be used to monitor changes over the coming years of the ecotourism operation for which longitudinal purposes, quantitative information is appropriate.

Qualitative data was collected using tools from Rapid Rural Appraisal (RRA) methodology. Information was also sought at the household level. The combination of the two approaches was to enable the identification of livelihood strategies and the role of marine resources in these strategies. Once this had been done for different social strata and for households with member(s) employed by the ecotourism operation, the information could be used to determine how employment of a household member may have affected or may continue to affect the livelihood strategies of households.

Attempts to carry out participatory wealth-ranking exercises were made to enable stratification of the village. Semi-structured interviews (SSIs) were conducted with key informants to determine the structure of the village to help with further stratification, and to help identify threats to and opportunities for livelihoods within the village.

Following stratification, household units were selected for further sampling. At the household level, quantitative data was collected on daily household production, consumption and sales. This data was converted into the value per standardised adult male equivalent to enable comparison across strata. Direct observation was made where possible to triangulate this information. Attempts were made to collect time-budgets for each member of each household.

In each household, SSIs were conducted with the head of the household to determine the main sources of income and the main activities of each household member. Information on historical and seasonal changes were also sought to gather a perspective on the status of each of the various households.

Household assets were recorded, and information gleaned on access to resources.

The methods used are discussed in more detail in the following sections.

3.2 Site selection

The research was conducted between May and August 2005 with fieldwork undertaken in June and July whilst the author was based at the CDBTP development on Vamizi Island. There are a number of communities near to CDBTP from where employment has been sourced and to which CDBTP aims to bring some benefits. However, due to the time restraints and the quantity of data sought, one was chosen for the purposes of this study.

A community can be defined as 'a group of people who consciously share a functional moral link such as kinship, occupation, place of residence, religion or values' (Renard, 1991 cited in; Malleret-King, 2000). For the purposes of this study the link used was the village chief. The village chief is an administrative representative elected at the community level. They are administratively below the *chefe de posto* of the *posto* or administrative post (Olumbe), which falls within the district (Palma district) and then the Province (Cabo Delgado).

Vamizi village is the closest permanent community to CDBTP, being on the same island, and from whom permissions to start the development were originally sought. It is also a small community of about 100 households (previously uncensused), so possible to sample a large proportion of the population. There are two other communities with recognised chiefs on the island, but these are itinerant fishermen who have arrived in the last few years and have formed camps there.

3.3 Participatory versus survey

The initial objective of the research was to use RRA tools to gather information about the community that could then be used to structure the more quantitative and traditional surveys and to compare with data from these. Participatory approaches to data collection such as Participatory Rural Appraisal (PRA) and its more extractive relative Rapid Rural Appraisal (RRA) are relatively new

methods that have become increasingly popular in socio-economic studies due to their flexibility, low cost, and rapidity at delivery of relevant information (Chambers, 1992; 2004). Quantitative surveys can help to describe what is happening, whereas qualitative participatory data can help to describe why it is happening. A combination of the two can therefore be very productive (Freudenberger, NA). Before going further it is worth noting that in the current study it quickly became apparent that most participatory techniques were unsuitable or liable to failure due to internal tensions within the community. The population were not prepared to work together on group exercises, and refused to do any of the exercises proposed. As well as the internal tensions within the community, this situation may have been related to a distrust of CDBTP and the author's link with it. The author was able to fall back on more traditional survey methods with which people were willing to cooperate on an individual basis. This enabled a build up of trust between the author and the people. Unfortunately, illness prevented a re-try of most of the participatory techniques towards the end of the field period.

3.4 Sample selection

Data were collected by the author and three local field assistants/translators whom the author employed and trained. None of these had experience in this line of work before and hence needed a significant amount of training. One was from a nearby village and had received 10 years of schooling so could read, write and translate fluently from the local languages into Portuguese. The other two were from Vamizi village, had received only two and three years of schooling, and were competent in basic written and spoken Portuguese. All work was conducted in Portuguese directly with the respondent where possible and comfortable for the respondent, or in Kimwani or Kiswahili and translated into Portuguese where necessary.

It was not possible to stratify samples on socio-economic groupings according to wealth category as originally planned using participatory wealth ranking. Random stratified samples were based on information gleaned from key informants during a transect walk through the village (section 3.5.1) as to important assets and characteristics of households as identified by these key informants that make a difference to livelihoods. This information included the

ownership of a shop (*barraca*) and/or fishing boat with sail (*dhow*), sex of the head of the household, whether households had a member employed by CDBTP, and primary sources of income (i.e. fish-trader, businessman, dependent, farmer). An attempt was made to give proportional representation in the samples to households with different characteristics.

The target was to collect household survey data for at least 30 households (about a third of the households in the village). Initially more households than this were surveyed to allow for non-response error (Lynn, 2001). A complete data set was only possible for 28 households.

3.5 Participatory techniques

Few of these were used with any effect due to the problems described in section 3.3. The intention was to use village mapping and wealth ranking to stratify the village, matrices of natural resources with seasonal diagrams and historical timelines to determine the main natural resources of importance to the village, how this varies through the season and what changes there have been in the past. Focus group discussions were also planned to discuss the impact of the ecotourism development on different social groups within the community. The techniques actually used and how they replaced the above will be discussed in more detail below.

3.5.1 Village mapping

A transect walk through the village with a key informant replaced the village mapping exercise and enabled an inventory of all households and names of the heads of households. During these transects, some of the key socio-economic aspects (identified through SSIs with key informants, see below) of each household were established to enable stratification in order to replace the wealth-ranking exercises which could not be completed with the village residents. This had the advantage of being quite detailed, but the disadvantage of having only the opinion of the key informant.

3.5.2 Semi-structured interviews (SSIs)

The participatory method used to the greatest affect was the one-on-one SSI. SSIs are probably the most powerful of the RRA tools (McCracken *et al.*, 1988). They are open-ended and interactive; guided by the researcher who has a set

of questions or subtopics which are rephrased or asked in a different way to triangulate responses (Kapila & Lyon, 2000). They are particularly useful for discussing specific topics or issues and collecting historical information. Probing answers and responses enables a deeper level of understanding of the issues than is often possible to achieve with quantitative approaches (Freudenberger, NA). This flexibility to open up new lines of questioning is part of the attraction of participatory techniques.

SSIs were used for a number of purposes in this study, with a total of 50 being conducted. SSIs conducted with the village chief and some of the elders were used to determine key socio-economic variables that distinguish livelihoods and groups of the population. Key informants were identified from different socio-economic classes (male and female, fishermen, traders, elders and youths (*jovos*)). SSIs with these groups were used in place of focus group discussions to discuss subjects such as how the ecotourism development has affected their livelihoods and the village in general, issues and difficulties faced by them and the village and the history of the village. Due to illness many of these interviews could not be repeated with a wide number of people, but they were triangulated through SSIs with the heads of households and between each other. SSIs with traders and fishermen were used to determine the accessibility of markets, access to the fishery, price of fish and historical and seasonal changes, and to establish the costs of fishing equipment.

In each sampled household, SSIs were held with the heads of the households. The subjects covered in these interviews included the main sources of income, the activities of household members and the importance to their livelihood, historical and seasonal changes in resources or sources of income, access to resources and threats to or issues about their livelihoods or resources. Results of these SSIs hence enabled the identification of livelihood strategies and provided information on many of the situational variables as shown in figure 2.3.

SSIs were conducted with all employees of CDBTP from Vamizi village who were working on Vamizi Island (CDBTP has operations on two other islands where two employees from Vamizi village work. Interviews with these two were not possible). These interviews covered their previous occupation, when and

for what reason they came to Vamizi village, how they use their salary, and their long-term objectives for the future.

Interviews lasted about 45 minutes to one hour so as not to tire the respondent, although there was no fixed time period. The purposes of the interviews and the research were explained to all respondents, and permission asked to continue. Questions were often rephrased in different ways to help validate the responses. Triangulation was possible through comparison of interviews, direct observation and results of the household surveys. This is an important aspect of validation (Chambers, 1992). All respondents were given the opportunity to ask questions at any point or to make any additional comments.

3.6 Household surveys

3.6.1 Definition of a household

A household is defined as '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). The household is not a fixed entity but varies in space and time, and in sub-Saharan Africa often comprise the extended family (Malleret-King, 2000). In livelihood frameworks, the typical unit is the extended household including members who are away from home but send remittances back to the resident homestead (Allison & Ellis, 2001). For the purposes of this study, a household is defined as in Marshall (1994), but following some time in the village, it is extended to include all people who shared money and cooked together, even if they lived in separate houses. This only occurred in one case of all the sampled households, where two houses located adjacent to each other contributed to the same cooking pot and undertook economic activities together. Household composition (gender and age) was re-recorded each time a household was surveyed, and only those present during the 24-hour period of recall (see below) are included in the household composition. This is partly due to the difficulty of quantifying the number of people external to the household who may help financially or otherwise to support it, and to the impracticalities of recording the external peoples' daily budgets, and partly because any gifts received by the household were recorded as part of the budget (see section 3.6.3).

3.6.2 Asset survey

For each household sampled, an asset list was drawn up during the first survey. This was not repeated owing to the short period of time over which the survey was conducted, and the amount of time taken to procure the information and therefore the burden on the respondent. Assets recorded included; boats (with details), fishing equipment, shops, coconut palms, cultivated fields (and the crops), livestock (sheep, goats and chickens), and electrical goods. This comprises some of the household asset endowments of Smith *et al*.'s (in press) framework (figure 2.3).

Scores were given to households on the basis of their assets creating a proxy measure of wealth (e.g. for coconut palms, those households with no coconuts were considered poor in coconut palms and given a score of 0, those with 1-30 coconut palms a score of 1, 30-100 a score of 2, and over 100 a score of 3; the scale ranged from 0-3 for each asset category). These scores were assigned subjectively based on the observed ranges. This is not the ideal method given its subjectivity by the author, but in the absence of other methods (participatory wealth ranking), it was deemed suitable to give an idea of asset holdings. The scores were then averaged across assets to give an average score of 0 to 3 for each households, with 3 being the richest households in terms of assets and 0 being the poorest. These were sorted from highest to lowest and divided into wealth categories based on large gaps between two scores representing a large jump in household assets. Cluster analysis was also performed on the ranked scores to attempt to group households and support the groupings of averaged scores. These groups were treated as proxy wealth groups *in lieu* of wealth groupings from participatory methods and used to analyse household budgets.

3.6.3 Household budgets

Data collection

Quantitative data for the comparison of natural resource usage were collected through daily interviews using a 24-hour recall technique (Bingham, 1987; de Merode *et al.*, 2004) to collect detailed household budgets. Questions were addressed to the head of the household. This was found to be most useful as the head of the household knew how much had been spent on food or other products and what had been procured or produced (as the head was often the primary producer and was normally responsible for rationing). Other household

members could often only estimate the quantity of food they had consumed. Detailed descriptions were made of all foods consumed throughout the period of 24-hours across meals and snacks together with their mode of procurement (fished/foraged, purchased or received as a gift). All items purchased, sold or given away by any household member were also recorded, as were all goods produced by any member of the household. Quantities of items were recorded in local household measures and subsequently converted to economic value (Mozambican Meticais and US$) based on market weights and prices. An exchange rate of Met22,500 to US$1 was used throughout the study as this was the exchange rate at the start of the study. Small variations are unlikely to affect local prices, as there is no local market for US$. For many goods, there is more than one market price. Where possible, the price paid or obtained for goods was requested. Where this was not possible (i.e. goods were not sold or purchased), the most commonly reported market prices of those goods were used for conversion. Each household was monitored on 3 days. Attempts were made to ensure these days fell on different days of the week and during different parts of the tidal cycle (spring and neap tides; which influence fishing activity), although the limited time available meant that opportunities had to be taken to sample the household when the head of the household was available. No households were resurveyed on consecutive days.

In order to understand the value of different marine resources to households, the household economy was divided into three axes as per de Merode *et al*. (2004): household production, consumption and sales. Household purchases were also calculated. Total household production (or income) was established by calculating the value of all goods produced or foraged by the household, given to the household, or the value of labour supplied during the 24-hour period. Labour rates were only included for a household where that member had been at home during the 24-hour recall period. This was to ensure only income to the household for persons present was considered.

The household production of different resources was also calculated. These values were standardised to calculate the household production of different natural resources per adult male equivalent (see below).

The same was done for: household consumption, defined as the market value equivalent of all foods and goods prepared for consumption that day by the household; household sales, defined as the market value income from all sales; and household purchases, defined as the market value of all purchases made during the 24-hour recall period.

Standardisation of results

Results were standardised to daily adult male equivalents to control for variation in household size and composition (Ravallion, 1992; Sabates *et al.*, 2001) using standard energy requirement tables produced by the Food and Agriculture Organisation (FAO) and World Health Organisation (WHO) (reproduced in WHO, 2000). Traditionally, the most common practice to account for variation in household size was a simple count of household members. However, this does not account for the differences in consumption needs of households with different age categories and sexes (Sabates *et al.*, 2001). Adult equivalence scales take into account these differences and are often used for poverty comparisons. They have been shown to vary in space and time and for different products, but to calculate them for a specific area requires large amounts of information. For reviews and how to calculate them see Deaton & Muellbauer (1986), Ravallion (1992) and Sabates *et al*. (2001).

Given the lack of large amounts of data, standard energy requirements can be a useful substitute to calculate adult equivalence scales. This is done by taking the energy requirement for a standard adult male, and dividing the energy requirement of other age groups and sexes by this value. Each sex and age class therefore has its own value, in this case between 0.5 and 1.1[1]. Each household member is assigned a value depending on the sex and age class and these are added up for the entire household. The household production, consumption, purchases and sales are then divided by the total value.

[1] Accurate ages were not available in many households as people did not know their own or their offspring's year or date of birth. Estimates were therefore made to place them into the following age groups. Standardisation values for these age groups were taken by averaging energy requirements across the range and were as follows: Males: 0.5 for 0-4yrs, 0.8 for 5-9, 1.1 for 10-18, 1 for 19-59, and 0.8 for 60+. Females: 0.5 for 0-4yrs, 0.8 for 5-9, 1 for 10-18, 0.9 for 19-59, and 0.75 for 60+.

Comparison of households

Household means for household production, consumption, purchases and sales were calculated for each household from the three 24-hour recall repeats. Comparisons of means between households with and without a member employed by CDBTP were conducted using one-tailed two-sample t-tests. Variance was assumed to be unequal where appropriate and degrees of freedom (d.f.) for each test adjusted accordingly. Power was calculated for each test that returned an insignificant result using the harmonic mean of sample sizes following Zar (1999).

3.6.4 Time budgets

An attempt was made to collect the time-budgets for each household member during the same 24-hour period as the household budgets were collected. However, it was found that very few people had a concept of how much time they had spent on certain activities, and often did not know what other members of their household had been doing who were not present during the interviews. Therefore, instead of estimated time budgets, the activities that a household were involved in were recorded. Involvement in an ativity on a day was recorded as one or zero. A household can be involved in more than one activity per day, but no proportion of the amount of the day was calculated. This data was used to calculate the proportion of days that households were involved in different activities. As households could be involved in more than one activity in a day, the sum of proportion of days for each activity will add up to more than one. Different economic activities were recorded, as were non-economic activities. Where households had adult members not involved in any economically productive activity, but reported that they did "nothing" on a day, the household was recorded as one for involvement in a non-economic activity.

3.6.5 Direct observation

Where possible, direct observation of fish catches at the landing site was made for a number of people from the village. The weight of the total catch was recorded, the destination of the fish recorded (how much was sold and for what price, how much for consumption within the household, and how much kept for drying to be sold later), and a measure of the effort (gear type and quantity and number of hours fishing). Quantities were converted to market prices and were

used to calculate the average daily income from fishing trips, and to triangulate and validate information from 24-hour recall information and SSIs.

3.7 Limitations

Limited time and extended illness of the author were the main limitations in this study, preventing some of the planned work and a large number of repeats. Limitations in the methods are reported through the results and discussion section where they affect the results.

4. RESULTS AND ANALYSIS

The results are presented in the form of the livelihood framework given by Smith *et al*. (in press) and shown in figure 2.3. Following a brief background of Vamizi village, the situational variables that determine the patterns of interaction are examined followed by the livelihood strategies adopted by the villagers. In the final section, resource use, a livelihood outcome, is evaluated using the quantitative data from the household surveys. Resource use is compared between households to determine the consequences of employment by a member of the household.

4.1 Background to Vamizi village

The transect walk through the village revealed a census of 88 traditionally built houses or shacks where people were living. Two more were being built during the period of the study. These houses are made in the traditional style for East Africa of sticks, stones and mud with macouti (coconut palm fronds) walls. Macouti thatching covers most, although three had some corrugated tin sheeting. There were five functioning *barracas* (shops/stores), an old one closed due to the need for renovation but for which the owners as yet had insufficient money, and two new ones being built. Two of the functioning shops had opened within the last 12 months, and another within the month before the beginning of the survey. There is a school with three years of education available which was opened three years ago. This serves Vamizi village and the two transient camps and now has 150 students across the three years, staffed by one teacher. This is built of sticks, macouti and grass. Also in the village are two wells built in colonial times, but which now give only a saline mixture of sea and fresh water. Fresh water therefore needs to be brought from the continent by *dhow* in 25litre gerri cans. One gerri can of water costs Met 5,000 (US$0.22).

The antecedents of some of today's villagers came to the island sometime in the 1950s mainly to grow crops and to fish. Initially, there were very few families, and the land where the village stands today was cultivated. In the 1960s, many families came to the island fleeing the Independence war. At that time, there was also a Portuguese settlement on the island in the form of a fish

processing plant that used to buy fish from the locals, and with whom there was a good relationship. This settlement had a cistern for water that the villagers could use. After Independence in 1975, many people left the island to return to their hometowns. The fish processing plant ran for a few years under State rule before becoming a ruin. Since the exodus of people after the war, the village slowly grew to the village it is today. People arrive for the purposes of fishing, and to marry, and settle. This means there are people from many different locations from Ilha de Moçambique in the south up to Mtwara in southern Tanzania making up the present population.

4.2 Situational variables

4.2.1 The economic environment

Aside from the ecotourism development on Vamizi Island, only two other formally employed positions exist: the teacher and the *infirmeiro* (village nurse), employed by the state. The teacher is stationed there although he is not from the area, whereas the *infirmeiro* is from the village and has been trained up by the government in basic first aid. The salaries of these two are unknown, but the minimum wage is Met 1,000,000 (about US$45) per month. 16 people who live in the village are employed in the ecotourism development: 10 in the construction team, two by the conservation department of CDBTP in the turtle monitoring team, one in the logistical team as a boat-boy and skipper, one as a guard by the security company responsible for the security of all CDBTP operations, and one as a staff chef. Monthly salaries for those employed by CDBTP range from Met 1,200,000 (about US$53) for a general helper on the construction site up to Met 3,000,000 (about US$133) for the staff chef. Food whilst working is also provided which has an approximate value of Met 285,000 (about US$13) per month at Vamizi village prices.

There is a small amount of casual employment within the village. One person works in one of the *barracas* for Met 1,000,000 a month (about US$45). The owner of this *barraca* spends most of his time out of the village with his family who live elsewhere. The other *barracas* are run by families who are based more permanently on the island and hence do not employ people to staff the shops. Casual employment is found on fishing and transport *dhows*. These are not salary based, but work on a system known locally as *nauli*. On returning

from fishing, if there are enough fish, a portion is taken as food of the fishermen and boat and fishing gear owners and the rest is sold. Of the part that is sold, a fifth of the value received is given to the boat and fishing gear owners, and the rest is divided up between whoever was fishing, including the boat and/or fishing gear owners if appropriate. Of the fish that is kept for food (*caril*), equal sized piles are made for each member of the crew plus the boat and fishing gear owners. Again, if the boat and/or fishing gear owners are fishing on the boat, they get two piles; one for being crew, the other for owning the boat or fishing gear used.

Money can also be earned for small jobs within the village, paid on a piece-meal basis; such as building someone's house, repairing a boat, or transporting goods. Payment for these services is not fixed but agreed beforehand and depends on who is paying and who is working. For example, to build the structure of a small house with sticks (labour only) would take two to three days and Met 200,000 (US$8.89) would be a reasonable price for completion of the job. These jobs are not very common, but there are "specialists" or *fundis* for the skilled jobs. These *fundis* do not do these jobs full-time, but take the opportunity when it comes. In no case was this work recorded during the 24-hour recall household surveys.

Before the initiation of CDBTP, there were no other tourism developments in the northern Querimbas Archipelago, and very few employment alternatives near to Vamizi Island. However, tourism is seen as an increasingly important sector in the Mozambican economy and is being widely encouraged by the government (Ministério do Turismo, 1995). There is rapidly increasing interest by private investors in the islands of the Querimbas, and this has resulted in the commencement of a number of other tourism operations. There is therefore some degree of potential employment from these, but there are a large number of people in the area and none from Vamizi village are as yet employed by another tourism operation.

There are an increasing number of people coming to Vamizi Island mainly for the purposes of fishing. The fishing camps of Kivuri and Golance, based to either side of Vamizi village, are now bigger than Vamizi village itself. A count

of the number of houses in Golance revealed 94 structures. In Kivuri there are 99 houses registered with the Kivuri chief, although this apparently needs updating as in the few weeks before interview, more people had arrived, perhaps increasing the number by 10. Of these, about 40 houses are now permanent throughout the year in Golance (interview with Golance chief's assistant), and about 70 are permanent throughout the year in Kivuri (interview with Kivuri chief). The remaining fishermen come for periods of a few months or weeks before returning with their catches.

Kivuri started as a community in 2002 when some itinerant fishermen were removed from the area now under concession of CDBTP and established a camp there. It has grown rapidly since then. Golance has been in place a little longer, but only started growing rapidly to its present size in about 2002. People are now marrying locally and settling in these communities, or find they do not have the resources to return to where they came from. The people in both communities come mostly from Nacala, a Province south of Cabo Delgado, although a few come from as far away as Ilha de Moçambique and others from closer by cities Moçimboa da Praia and Pemba. The men interviewed in these villages stated the reason they came was because there was nothing left to fish where they came from, so they came to Vamizi for "*vida*" (life).

About two-thirds of the island is now in the concession of CDBTP, and one-third belongs to the local communities. Much of the area set aside for the communities is still uncultivated and forested, although being a coralline island, it is difficult to tell how much more space could be available for agriculture.

Vamizi is isolated from markets by distance and sea. In line with development strategies for artisanal fisheries in Mozambique (Ministry of Fisheries, 1994) which aim to reduce post-harvest losses and increase catch volumes, new fish processing plants have been developed in Palma and Moçimboa da Praia which can handle fresh goods. However, these are not accessible to fishermen on Vamizi due to the distance involved and lack of facilities to maintain fresh fish. Many traders come to the area to buy dried fish to sell in Moçimboa da Praia or Nampula or inland on the continent. Many traders will buy fresh fish

and then dry it on the island before taking it to market. Normally, the goods go by *dhow* from Vamizi to Moçimboa da Praia (a distance of about 50 nautical miles) and then onwards by road. Given good conditions, this journey can take one to two or possibly more days. Two traders also come from Tanzania to buy fresh lobster and octopus, using cool boxes and ice to keep them fresh. They only come during the spring tides (*somana*) when octopus fishing occurs (see section 4.1.3), and may only spend a few days on the island. There are eight people from Vamizi village who regularly buy fish for drying and then take it to Moçimboa da Praia or beyond for sale. These include all the shop owners. The amount they buy varies on the amount of money they have available. Generally, they will take fish to sell every two or three months, and (those who own shops) buy goods for their shops and return to Vamizi.

There is no market place or system on the island. Instead fish is sold at the landing sites or even between fishing boats returning from fishing grounds. Fishermen have their normal traders who are based at their specific landing sites where they keep the craft they fish from or the equipment they use, or they sell within the village to villagers who are looking for *caril*. Dried fish has a higher value than fresh fish, and where possible fishermen will keep excess catch to dry and then take to Moçimboa da Praia to sell themselves or sell to traders on the island. Prices are agreed between fishermen and their traders, and can be seen for fresh fish, shark meat, shark fins, fresh octopus, dried fish and octopus and lobster in table 4.1. Prices vary on the island also depending on the number of traders present. Traders buy octopus for Met 7,000 to 8,000 (US$0.31 to 0.36) per kilogram, except for the traders who come from Tanzania with cool boxes who will pay Met 10,000 (US$0.44) per kilogram. They will buy as much octopus as they can, but only come for a few days each spring tide. No-one reported problems in selling fish or other marine products when they wanted to, although the price could vary.

Resource	Vamizi price	Moçimboa da Praia price	Nampula price
Fresh bony fish (Osteichthyes)	Met 8,000 (7,000-10,000) *US$0.36 (0.31-0.44)*	N/a – no means to keep fresh	N/a – no means to keep fresh
Fresh shark/ray (Chondrichthyes) meat	Met 3,500 *US$0.16*	N/a – no means to keep fresh	N/a – no means to keep fresh
Shark fins (*mapenzi*)	Met (1,250,000-3,000) *US$(56-133)*	Unknown	Unknown
Fresh octopus	Met 10,000 (7,000-10,000) *US$0.44 (0.31-0.36)*	N/a – no means to keep fresh	N/a – no means to keep fresh
Dried fish or octopus	Met 25,000 (20,000-30,000) *US$1.11 (0.89-1.33)*	Met (30,000-35,000) *US$(1.33-1.56)*	Met 45,000 in dry season (35,000 (in wet season)-46,000) *US$2.00 (1.56-2.04)*
Lobster	Met (50,000-85,000) *US$(2.22-3.78)*	N/a – no means to keep fresh	N/a – no means to keep fresh

Table 4.1. Price per kilogram for the main marine products on Vamizi Island and in the two largest market towns. Prices are in Met and US$. Prices in brackets represent the range of possible prices, and those outside of brackets represent the most commonly reported prices where available.

The price of fish and octopus has increased rapidly in the last few years due to increased demand in places such as Nampula. Fish traders did not start arriving on the island until about 1999, although fishermen from Nacala had been arriving since about 1994. Before traders arrived, villagers used to dry their fish and take it to Palma to sell. At about this time, there was no price per kilogram and fish was sold in bundles depending on the price the fisherman wanted. Octopus was caught and either eaten fresh or dried for consumption within the household. Only last year, octopus and fish were being sold for Met 5,000 (about US$0.20) per kilogram (personal observation and information from SSIs), and before 2000, the price was about Met 3,000 (exchange rate unknown, but price reflects relative change in value) per kilogram. Prices of dried fish on Vamizi and in other places are also reported to have changed, but no reliable estimates were found for the amount. The number of traders has increased. One trader from Vamizi village mentioned that in the past, he used

to take two to three tonnes of dried fish to Nampula every month, whereas now the competition among traders is greater and he only manages to get about 600kg of dried fish every two or three months. SSIs suggest many villagers are happy with the increase in the number of traders due to the higher prices they now receive.

The Project has started to pay Met 10,000 per kilogram of fish and requires about 50kg per week at present to feed employees and construction workers. This is a very small quantity. In the future, fish will be required for guests, and certain qualities will be required. This may lead to a differentiation in price between different species of fish, with higher values going to species from the Carangoides (trevallies), Lutjanidae (snappers), Scomberoides (tunas and mackerels) and Serranidae (grouper) families.

The local communities of the area do not traditionally eat lobster. In the past, the price of fresh lobster was Met 20-25,000 per kilogram (2003, personal observation). Since the arrival of traders of lobster, there does not appear to be a settled price, but prices range from Met 50,000 to 85,000 (US$2.22 to 3.78) per kilogram. Fishing for lobster is done mainly when the traders with cool-boxes are present, and sometimes they provide the boats (sometimes with engines) to go diving for lobster and pay the fishermen for their catches.

Other markets on the island are also limited by distance and sea, but still people come to Vamizi from nearby coastal areas to buy or cut sticks and building materials. One large log (*staka*) can be sold for Met 2,500 (US$0.11); three or four thinner building sticks (*lenha*) can be sold for Met 1,000 (US$0.04); 50 of the thinnest sticks (*nenga*) can be sold for Met 15,000 (US$0.67). Some respondents express worry at the amount of wood that is taken from the island, and large amounts were observed on the beach ready for transportation, particularly in Kivuri.

Fishing equipment is mostly bought in Moçimboa da Praia, aside from the smaller items such as hooks that can be bought in nearby Olumbe. Many of the boat building materials and fishing equipment are subsidised by the government.

There is no formal credit available on the island. However, when people are short of money within their households, they sometimes approach fish traders and ask for a loan. This loan they pay back in fish when they go fishing, to the same value as they borrowed. This appears to be used only when people have few other options, and only small amounts are borrowed.

Shops on the island supply dried or canned goods and other goods such as tinned tomato paste, onions, garlic, soap and cloth. Most business, however, revolves around staples such as maize flour, rice, white flour, sugar, tea, and salt. These are purchased more cheaply in Moçimboa da Praia (on mainland), where, if possible, people will buy a sack (20-50kg) of their chosen item. Prices vary between shops on the Island. SSIs with shop owners and with those who sell bread, and with other key informants, suggest a support for the presence of CDBTP as there are now many more people who come to the village with some money to buy goods. There are over 150 workers on the island, which represents a significant increase in trade, although mostly limited to Sunday afternoons when there is no work. This may be partly responsible for the recent increase in number of shops.

Cassava is purchased in Olumbe, or brought by families who have houses in Olumbe and grow the crop there.

4.2.2 Villager characteristics

The initial SSIs, transect walk and asset surveys revealed the majority of household assets revolved around production requirements. These include fields (*machamba*), boats including dugout canoes or wooden boats with sails of varying sizes, fishing equipment and coconut palms. Livestock (goats, sheep and chickens) are used as a bankable asset rather than for the production of food, and when they have the available money, a household may try to buy a female animal at a young age and start a *criação* (group) of animals. Goats and sheep may occasionally be eaten for a festival or ceremony, and chickens are also rarely eaten. Animals are instead generally allowed to breed and increase in numbers and when there are enough, an animal may be sold if money is

needed for something specific, or during times of hardship (SSIs with key informants).

Transistor radios are the only form of link to national news, and many heads of households own one. There are a couple of cases of further electrical goods including solar panels (sometimes salvaged from long-line buoys found washed up on the beaches or found out at sea), and a television, video and generator set in one case. Figure 4.1 shows frequency of ownership of these different assets from the household asset survey.

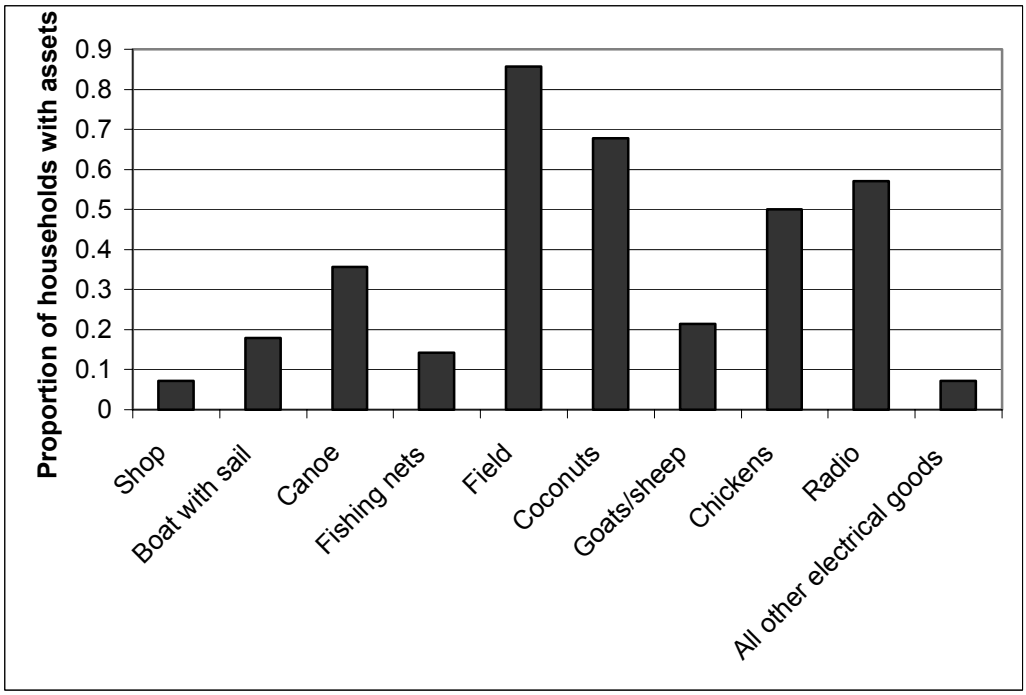

Figure 4.1. Proportion of households with different assets (n=28 households).

Fields and coconut palms are the most frequently owned household assets. Fields are not bought or formally distributed in any way. The oldest inhabitants own areas that they have cultivated from bush. More recent inhabitants ask permission from the village chief and elders to cultivate new areas of land, or they may be offered areas that have been cultivated previously by other households but on which those households are no longer active. In some cases previous owners may request some of the produce as payment, or produce may be offered in return. There does not appear to be a problem with the availability of land. Only in one case did a respondent mention that CDBTP is taking up a lot of land and express concern that the boundary of the project seemed to be coming closer and closer. This concern did not appear to relate

to the availability of land for agriculture, but maybe to the other benefits the land may offer such as wood.

Within Mozambique, where a coconut is planted, the owner of that coconut palm has rights over the land the palm is planted on. The coconut palm is also very valuable for production of coconuts which may be sold, and for the production of *macouti*; the coconut fronds, which are used for construction purposes. Again, the older residents are likely to have more coconut palms, but newer residents may request permission from the village chief and elders to plant coconuts in new areas. In 2004, a disease spread through the majority of coconut palms in and near to the village itself, preventing production of coconuts for a whole year and killing a number of palms. This year the palms are just starting to recover and produce coconuts again. Palms outside the main village escaped the disease, but the majority of those outside the village are owned by just a few people. The planting of coconuts or the purchase of sheep, goats or chickens may be seen as part of an accumulation strategy, or insurance against future periods of hardship.

The ownership of livestock (goats and sheep in particular) and coconuts is unevenly distributed within the community as shown in figures 4.2 and 4.3. This is particularly important in the case of goats/sheep. An issue raised by all four of the respondents interviewed about threats to peoples' livelihoods mentioned the way that goats and sheep are kept by those of the community who can afford them. They are kept in the open and are blamed for the damage of many crops. Despite having fertile soils where many different crops apparently grew in the past, goat damage restrains them now to primarily one crop (millet) and small amounts of sorghum wheat in some areas. Both these crops are out of reach of goats. The few people who own goats/sheep are therefore affecting a much larger number of people who have fields.

Fields are cultivated annually if the owners are well enough to do so during the planting time. In a good year with plenty of rain, they may provide a year's worth of crop (when eaten with other staples). This year, however, there has been a drought and the fields have produced very little that may only last a few weeks to a couple of months for some people.

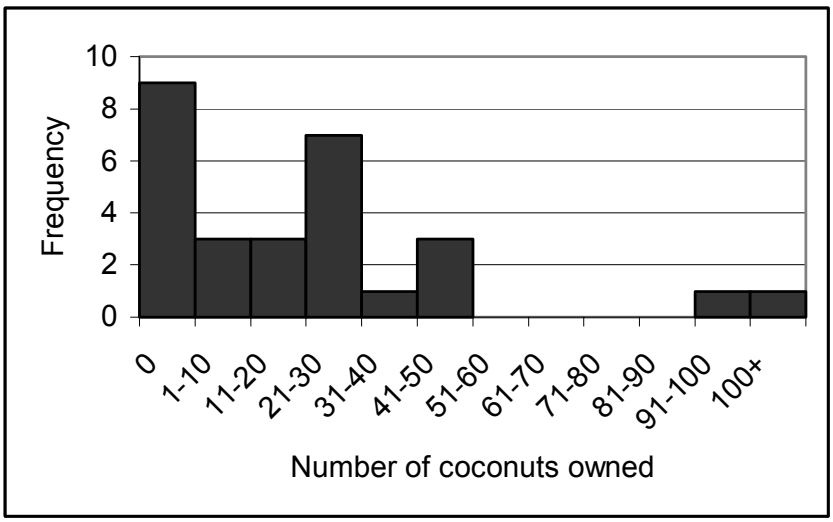

Figure 4.2. Histogram of coconut palm ownership from 28 households.

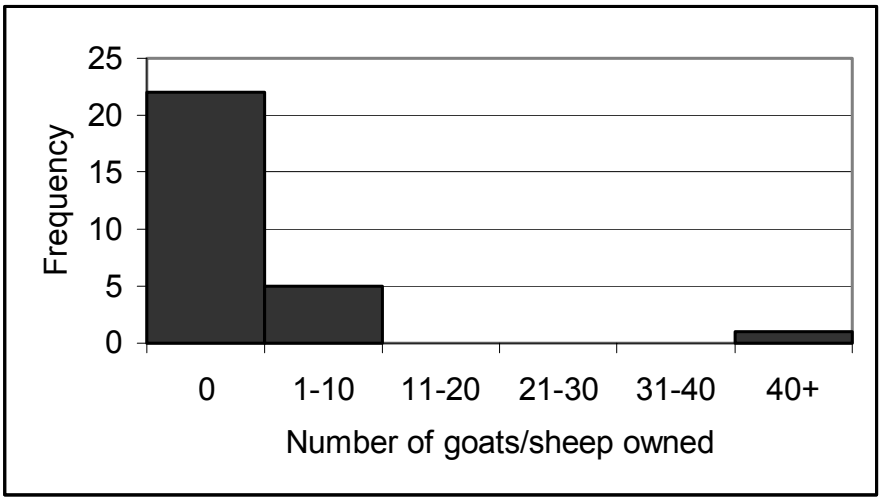

Figure 4.3. Histogram of goat/sheep ownership from 28 households.

Figure 4.1 also shows that the proportion of households with boats, either dugout canoes or boats with sails, is relatively low. This leaves a much larger proportion of households with issues of access to marine resources; either having to pay *nauli* or restricted to access them by foot.

Scoring of assets for households lead to only one obvious break in the scores, which left one household only as being rich (with a score of 3), and then a large range of scores from 0.2 to 1 (figure 4.4). A point between the two with roughly half of the remaining households on either side was taken to divide this point. A cluster analysis of average scores using centroid clustering and Euclidian squared distances provided only two main clusters. One cluster was composed of only one household, the “richest”, and the other cluster was composed of all other households. This clustering therefore does not support a further break of

the large cluster into two groups, but breaking this group up enables a more useful range of wealth. The fact that key informants on the transect walk were not able to divide the village up by wealth into more than the richest few households and "the rest" supports the results from this asset scoring, and suggests that most people fall into a low "wealth" category, but that there is a range of wealth within this category (hence breaking the low wealth category into two for the purposes of this study to reflect the range of wealth). The richest household owns a shop, two *dhows*, an estimated 1,500 coconut trees, 45 sheep or goats, and is primarily a fish trader.

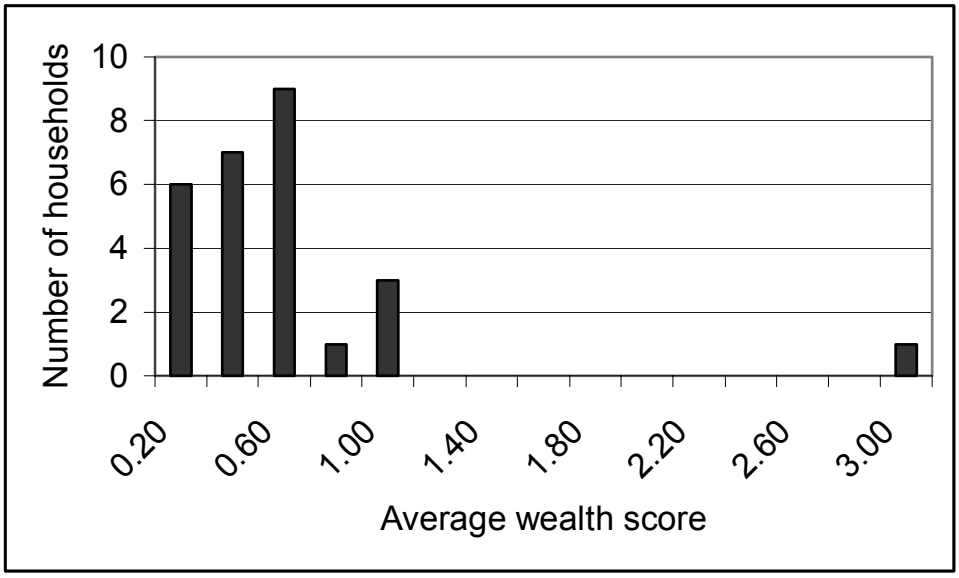

Figure 4.4. Number of households with each average wealth score calculated from asset holdings (n=28 households).

The livelihood objectives of households appear to vary with respect to the different resources. Results from the household surveys shown in figure 4.5 demonstrate that fish is an important source of nutrition as households either buy or catch their own fish. It also provides some source of income or cash source as some fish is sold, and plays a role in social networks demonstrated by the amount of fish received as gifts. Octopus, on the other hand, provides very little benefit in terms of nutrition, but greatest benefit as a source of income or cash. Coconuts play a role in the nutrition of households, but are also a source of cash or income, and according to value are the most important local resource in terms of daily household production. Millet fields are most important as a source of nutrition.

Direct observation of fish catches and the results of SSIs confirms the role of fish, not only as a source of nutrition, but also important as a source of cash or income for the purchase of other goods, with the majority of catches being sold (figure 4.6). A larger proportion of catch is dried than consumed, suggesting that it is either being stored for consumption on a future date, or that it is to be sold dried. However, SSIs also confirmed that where an excess of fish is caught, above and beyond that necessary for immediate nutrition and to provide enough money to feed the household, this fish is dried, as dried fish has a higher value and can be used in times of bad weather or short-term hardship when fishing is not possible. SSIs revealed that people prefer to receive large sums of money in one go as this enables more flexibility in how the money is spent. Where only small sums are received at a time this money is always spent on subsistence requirements and may not always be sufficient. Where larger sums are received, a large sack of food can be purchased, reducing pressure on finding food for a longer period, and there may be some available to spend on clothes, school books for children, or other non-essential items. This is one reason why people like to have jobs with CDBTP as they are paid in a lump sum at the end of each month, which enables them to do more with their money. It may also explain why people like to dry and store as much of the fish caught in excess of immediate requirements as possible so that it can all be sold in bulk and for a higher value.

Direct observation of the high incidence of octopus fishing by women and children at low spring tides and the extent of catches, supports the observation that octopus is most important as a source of household cash or income. This may be related to the recent high value of octopus as mentioned in section 4.2.1. It could be an important social activity (as virtually all women and children leave together to go octopus fishing), or for some an activity of last resort. Some women in SSIs stated that the income made by men from fishing and/or employment or trading is not what they rely on to feed the children as it is the men's money and could be spent on alcohol or second households or new clothes for themselves. Therefore, they rely more on octopus fishing. Households without men (2 sampled) stated the importance of octopus fishing as, especially with poor output from their fields this year due to a lack of rain, they must secure an income to purchase food for the family. Even a household

with a member employed by CDBTP stated the importance of octopus fishing, as the food and money the employed member leaves with the household does not last very long, and towards the end of the month they go hungry until they are able to catch some octopus. The opposite view to this was given by some men during SSIs, who stated that octopus fishing is purely for the benefit of the women who use the money to buy new capulanas and clothes. It seems, therefore, that octopus fishing is likely to serve a variety of objectives depending on the characteristics of the household, ranging from last resort through to recreation serving social functions or source of cash.

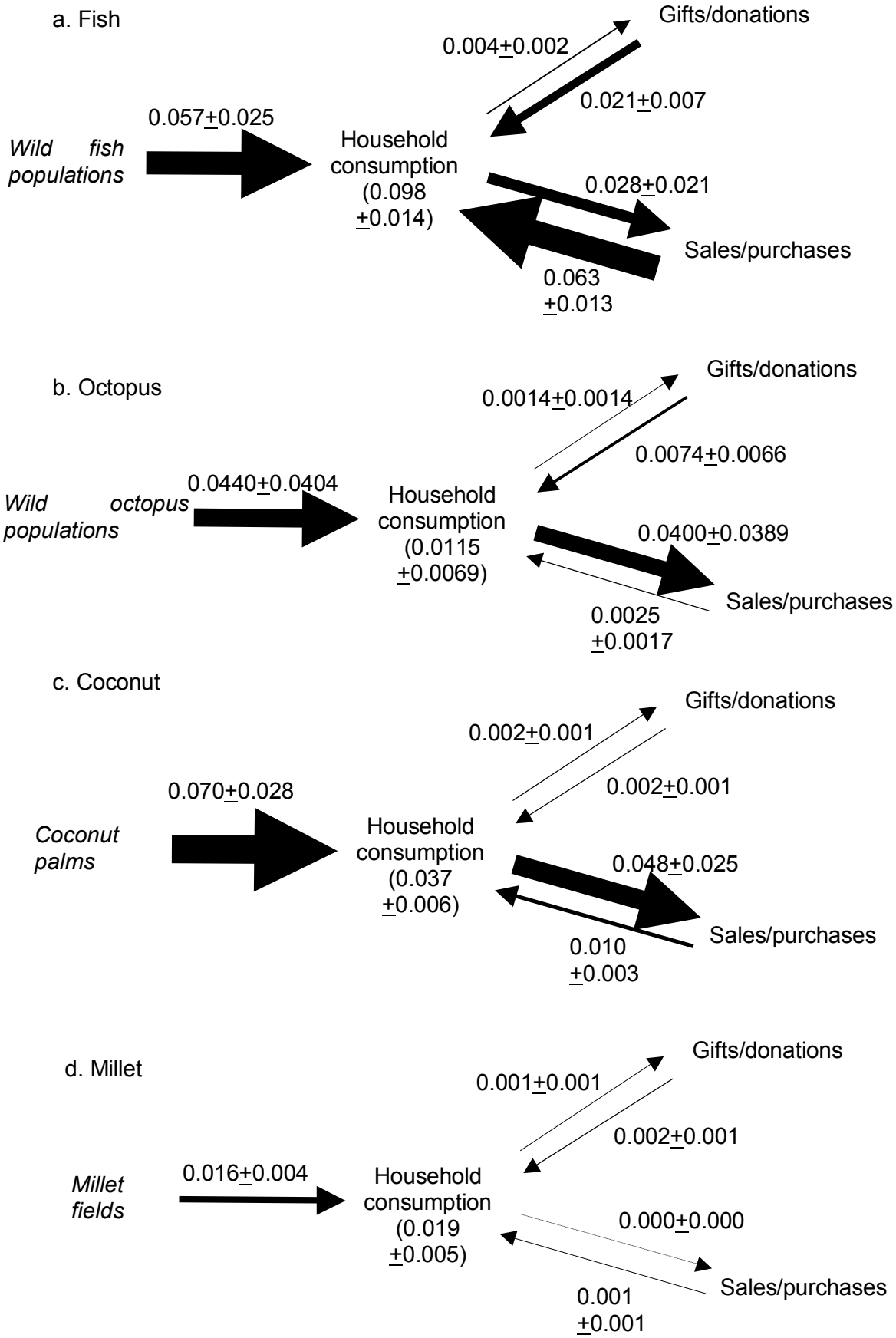

Figure 4.5. The flow of local resources through the household. Arrow width is weighted according to the volume of flow, and direction indicates either inflows or outflows. All

values are expressed as daily mean household US$ per adult male equivalent ± standard error (n=28 households).

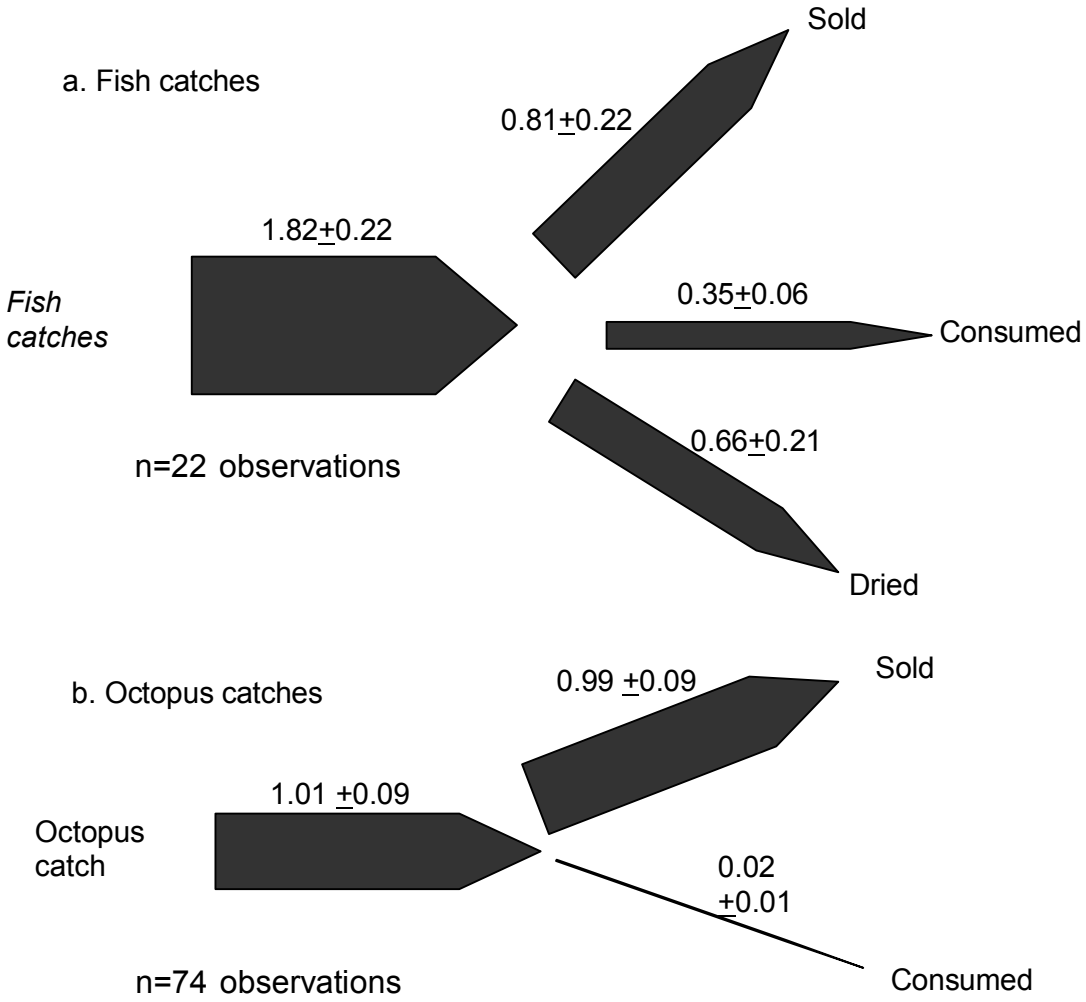

Figure 4.6. The size and destination of (a) fish and (b) octopus catches. Arrow width is weighted according to the value of the flow. Values are shown as the average market value from each catch ± standard error, represented in US$ (n is shown separately for fish and octopus catches).

4.2.3 Fishery characteristics

Little information was collected with respect to seasonality of yields. However, fishing occurs all year round, with the main locations determined by the monsoon direction. The monsoon either comes from the north or from the south, and as Vamizi Island is long and thin running west-east, one side or the other provides protection from the monsoon. Occasionally weather can be too rough to fish, and fishermen say that at certain times of year the sea can be very "dirty" with lots of algal growth that inhibits fish catches as it covers the gears in the weed and makes them less effective. Octopus fishing occurs year

round, but is limited to periods of spring tides for the majority of octopus fisherpeople.

Some resources are seasonal, including *cotanda*, an activity carried out by women to catch very small fish that come close to the shoreline in large quantities at certain times of year which are dried and sold on the continent.

Drying of fish occurs year round, although it is limited during the wet season (February to April). Harvesting of agricultural produce occurs in April.

In section 4.2.1 the growth of the fishing camps is noted. In 18 out of 37 SSIs in Vamizi village, the respondents blamed the increase in people at these now almost permanent camps for restricting their fishing areas or lowering their catches. Not all of these 37 SSIs were on the issue of fisheries resources or historical changes in resources, and in four SSIs with key informants on the issues and problems faced within the village, all of them mentioned the increase in the number of people to these communities as being one of the biggest threats to peoples' livelihoods in Vamizi village. These newcomers bring methods and gears that damage the home of the fish, and are reportedly "driving the fish away", as well as closing out the available fishing spaces for both octopus and fish. This is particularly important for the octopus fishery where the habitat is much smaller and there are lower barriers to entry. The only barrier to entry for the octopus fishery is the skill required to spot the octopus and extricate it from its lair, as evidenced by a report from one household who had arrived from an inland continental area specifically for the husband to take up a job at CDBTP, the women and children did not know how to catch octopus. However, those who come for the purposes of fishing because resources elsewhere are depleted are already skilled in the technique.

The traditional methods of fishing in the village are using fish traps, called *gaiolas*, hook and line, and gill nets. *Gaiolas* cost Met 30,000 (US$1.33) each from Moçimboa da Praia, and last approximately 4-6 months. The average daily catch for fishermen from Vamizi returns a higher value than this (table 4.2), so they are relatively inexpensive. They are left in the water and can be retrieved and fish taken from them whenever fishermen want. Most *gaiola*

fishermen own more than one, and can own anything up to 40 or 50, although they may check just a few on each trip. This technique allows for part time fishing, as it only takes a few hours to check a few traps and retrieve the catch. It can be done by foot, so requires little other equipment.

Hook and line fishing is done at day or night, and requires a considerably larger investment in time. The 15 direct observations of *gaiola* fishing trips ranged from just 50 minutes to 4hours30minutes long. The four direct observations of hook and line fishing trips included three night trips and ranged from 7hours 30 minutes to 14 hours long. Hook and line fishing is also done by children from the shoreline, normally for very small and yield few fish which are either consumed there and then or taken home for consumption.

The longer fishing trips require access to a boat – either in return for *nauli*, or of their own. Homemade hooks can be made in the village ranging from Met 500 each for the small ones to Met 2,000 each for the largest, or about the same price for factory made hooks, which are available on the continent. Line costs around Met 25,000 for 50metre length of the smallest sizes. This can be bought in the shops on Vamizi or on the continent.

The three observations of fishing with nets had a trip time that ranged from 2hours to 5hours long. Two of these trips were made without the use of a boat. The fish catches per day per fisherman for the different methods were as detailed in table 4.2. A simple one-way analysis of variance did not show any significant difference between catch sizes for the different methods.

Fish catches were sampled at landing sites. A large distribution in space and time of landing sites that are used by village fishermen limited the number of observations possible. However, the number of fishing trips observed for each type does appear indicate a preference for *gaiola* fishing amongst village fishermen as the sampling method should not have favoured one type. This may be related to the small amount of time and investment in equipment that is required for this method.

Fishing gear	Gaiola (n=15)	Hook and line (n=4)	Nets (n=3)
Fish catch	1.79 ± 0.25	2.55 ± 0.69	1.04 ± 0.24

Table 4.2. Mean value of catch per fishermen per day for Vamizi village residents from direct observation of fish catches. Values in US$ ± standard error. n=number of direct observations for each gear.

There are no reliable estimates for the cost of building a dugout canoe or a *dhow*. This is largely because they are not usually bought or made in one go, but people will slowly accumulate all the materials as and when they have the money available, and then pay for *fundis* (boat builders) to do the work a bit at a time until the whole boat is finished. They are generally made on the continent rather than Vamizi, although a few are being made on Vamizi, and there are *fundis* on the island who will repair boats. One estimate was that it costs Met 45,000,000 (US$2,000) to make a large *dhow* from scratch. The whole process can stretch over several years however, so this estimate is very rough. All boats also require regular maintenance, which involves the payment of *fundis* and the purchase of materials. Sail material is available from Moçimboa da Praia and costs about Met 35,000 (US$1.56) per meter, requiring about 20 meters to make a medium-sized sail. These sails can last 3-5 years with maintenance before they need to be replaced. Dugout canoes will be cheaper to make as they require less materials and less skill, so may just involve someone's time.

100meters of ready-made fishing net costs about Met 2,500,000 (US$111.11) in Nampula according to one estimate. There are a variety of types of net, including materials, diameter and strength, for which the price will vary.

These prices are estimates from key informants and SSIs, and are therefore not exact. However, they serve to show that the ownership of nets and boats with sails to access the best fishing grounds (i.e. furthest from the majority of people) require considerable investments of money and maybe time in an area where no formal credit is available, employment is very low, and the minimum wage only Met 1,000,000 (US$44.44) per month. Only those people with access to sufficient money, such as people with jobs, traders or businessmen, or people who have access to credit from areas where it is available, could afford to own

this sort of equipment. Once they do own it, they can staff it, "paying" staff with a portion of the catch, and receive *nauli*. This allows for passive fishing. Two people in the household surveys mentioned that an important source of income for them was the *nauli* from their dugout canoes as they were too old to fish themselves.

A final form of fishing requires mention here. This is diving for sea cucumbers (*macajojo*) and lobster. This requires the investment of a mask and snorkel, the materials for which can be bought from Moçimboa da Praia. *Macajojo* can receive a high price depending on the species caught, with anything from Met 1,000 for one animal to Met 125,000. These go to Tanzania for the Chinese market, which is a reasonably mature one that used to attract a large number of fishermen. Only a few people in the whole village, not falling in the household surveys, where reported to make a living from this. The only objective of this sort of fishing is for the income as neither lobster nor *macajojo* are eaten locally, but people report the catches to be very low, with maybe only one or two animals caught in a whole day's diving, and requires some skill by the diver in terms of breath-holding ability.

As discussed in section 4.2.1, most of the market for fish and other products is remote from the island and accessible only via traders or by travelling. There is a big enough demand for fish on the island from traders to be able to sell any amount of fish that is caught, but the distance to the main markets does reduce the price available to fishermen (see prices of dried fish available in different locations in table 4.1).

4.2.4 Institutional environment

A Mozambican national may fish anywhere within Mozambique, although all craft require to be registered with the district *cabo do mar* (maritime authority). There are also restrictions on the gear used. Foreigners must pay a licence at both Provincial and district level, and register with both. However, there is no law enforcement or patrolling of the area for unregistered craft and fishermen or illegal immigrants. At the local level, there is no institutional control over access to fishing areas. Fishing tasks are generally divided between males and females with fishing done only by males, and octopus fishing primarily by

females. Other than this, everyone is free, in local institutional terms, to fish where they want and how they like. Below the community level, institutions such as family and friends, or social standing, may play an important role in access to resources through control of access to fishing craft and gear.

Employment opportunities within CDBTP are brought to resident communities surrounding the tourism area by the CDBTP Community Liaison Officer (CLO). He liaises with village chiefs to source employees who will be reliable and able to work. Rarely is education required for many of the jobs available within CDBTP at present. This method, although necessary, does mean that access to jobs may be restricted to some degree to people in favour with village chiefs and authorities. Not all jobs available are sourced from Vamizi village, as over 100 are involved in the construction process. Only 16 of all the workers on Vamizi Island (of over 150) are from Vamizi village. All workers are resident in the CDBTP area during their period of work, although there are opportunities for people to go to the village to buy goods on a Sunday afternoon or during leave or holidays. The administrative post for the area, Olumbe, a town of nearly 6,000 people, generates most of the employees, and some come from the Provincial capital Pemba, over 200kms away, and other areas. This has caused some consternation among some of the residents of Vamizi who feel more employment opportunities could be offered to them. However, a number of people from Vamizi have been employed in the past, and have either not been willing to continue working and preferred to return to their traditional lifestyle, or have been laid-off. SSIs with the CLO revealed that when making the decision of who to call for employment, he and the village chief often have to take into consideration household arrangements and whether the household would be able to continue to function with a member away for long periods.

Access to the island is not restricted. In neither Golance nor Kivuri was a system recorded whereby people could be turned away from the island, and the key informants expected the number of people living there to continue to grow. Some report that it is necessary to pay some sort of small fee for setting up a base on the island to the local village chief, but this is small and unofficial.

4.3 Livelihood strategies

The livelihood strategy of the majority of village members appears to be one of subsistence. Relatively few speak of improving their conditions, or of having the capacity to improve their conditions. Where they do speak of hopes for the future, CDBTP is often noted as the key factor that people see will help to improve their personal or communal conditions, either through employment, or through a paternalistic relationship between the community and CDBTP and the provision of basic goods and services such as the village health post that has just been built by CDBTP. Those that did speak of ways they are improving their personal or household conditions were either owners of shops or longer-term employees of CDBTP. These improvements include the building of *dhows* for transport and fishing, investment in new houses, or the planting of large fields of coconut palms.

The subsistence strategy is reflected in their eating patterns. There are no set eating times: they will eat when they have managed to secure some food. Most often, members are concerned with securing *caril* - the accompaniment to staples, which can be composed of fish, meat, or just sugar. Fish is most common and preferred, and can either be bought, or comes directly from fishing. When this is secured, they either take the staples from inside their house, or buy a staple with money or savings they have available. Meals can therefore be any time of day. A large amount of food is cooked, and most often neighbours and family are called over to share from the same pot. Likewise, when a neighbour or nearby relative has secured food and prepared it, they will call them in return. This may be a food security strategy to reduce the number of times a household goes without any food.

The subsistence strategy of many households is supported by the results of the daily activity budget and the results from the primary and secondary sources of income for each household. Figure 4.7 shows the number of households with different activities forming primary and secondary sources of income, and figure 4.8 the proportion of days sampled that a household is involved in some of these activities. Figure 4.7 demonstrates that fishing is the most frequently cited primary source of income for households, whilst octopus fishing and farming are the most frequently cited secondary sources of income within

households. Coconut palms, bread, fish trading and business or other sources of income (including making hooks and dependency on other households) are relatively uncommonly recorded as primary or secondary sources of income. Results from the daily activity budgets, however, show that very few days are spent with a household member doing any economically productive activity at all (figure 4.8). Each household can be involved in more than one activity on any one day, either with one member involved in more than one activity, or different members involved in different activities. This means the sum of proportions across activities is greater than one. Unfortunately, not all households were sampled an equal number of times for the activity budget, so different activities will be represented to different degrees depending on the number of times each household involved in a particular activity was sampled. Equally, not each household is involved in each activity. It is therefore not possible to make accurate comparisons between the importance of different activities within the community from figure 4.8, but it does give some guide.

Given the relative importance placed on fishing as a source of income, it would be reasonable to expect the number of days households within the community apportion labour to fishing to reflect this. Octopus fishing and farming are seasonal or restricted to certain states of tide that occur in monthly cycles (see section 4.1.3), and their importance or contribution to the household may therefore be under-represented in daily activity budgets. However, fishing does occur daily and nightly around Vamizi (albeit by different individuals); i.e. access to the resource is less restricted temporally. It only stops during severe weather conditions that were observed on only a couple of days out of the whole survey period of over two months. Another way to verify the amount of effort invested in fishing in the community is to compare the average observed average catch size with the average recorded production by households during 24-hour recall.

The average household size, in terms of number of adult male equivalents, is 3.79. Dividing the average value of a day's fishing catch for one person (figure 4.6) by this figure reveals an average household production from fishing (across all households that fish) of US$0.48 per adult male equivalent for each actual day fished (assuming only one member of the household goes fishing); significantly higher than the average daily production from fishing shown in

figure 4.5 of US$0.057±0.025 (mean ± standard error, n=28). A rough calculation from this suggests that the average household only sends a member fishing once every 8.5 days (potential daily household production per adult male equivalent if fishing occurred daily, divided by actual average daily production for the same: 0.48/0.057 = 8.5). If only those households that record fishing as a primary or secondary source of income are considered, mean daily consumption per adult equivalent is US$0.082±0.036 (n=19). The same calculation reveals that even those households who record fishing as a primary or secondary source of income only fish once every 5.9 days. The average catch for a household recorded in the 24-hour recall survey is estimated as US$1.16 ± 0.46 per day a household member goes fishing (n=16 24-hour recall periods). This figure is not significantly different to the value in figure 4.6 of US$1.82±0.22 (n=22 observations) provided by direct observation in a comparison of the means using a two-sample t-test. However, it does make a difference to the calculation. Using the figure provided by 24-hour recall, and going through the same process, a household that records fishing as a primary or secondary activity, even if using their own recall of actual fish catches, (households recording fishing as source of income have the same average household size as the whole sample), sends a member fishing only once every 3.7 days ((1.16/3.79)/0.082 = 3.7).

When interviewed, fishermen initially replied that they fish every day. Further interviews later in the study revealed people would go perhaps 4-5 times a week (16-20 days a month), or for 4 or 5 days over the spring tides (8-10 days a month). Other fishermen only report going fishing when their money runs out from the last fishing trip and they require more for buying food. The figure of once every 3.7 days is quite similar to a value of going only 8-10 days in a month. It does suggest that fishing is done as part of a subsistence strategy. If households wanted to improve their conditions, they may be expected to devote more time to fishing which is not temporally restricted. It may also indicate that people only go fishing when they need to (i.e. to generate cash for subsistence), or perhaps only in periods when they perceive returns to effort are greatest or exceed returns from other activities (e.g. during spring tides). The preference to dry fish where excess is caught (see section 4.2.2) for later sale to receive a lump sum may indicate an accumulation strategy for future hard times (i.e. by

enabling the purchase of a large sack of staple), or as an opportunistic endeavour to enable the purchase of basic items in the household such as clothes that are not bought on a daily basis. It could also be an accumulation strategy for development of the household; investing the proceeds in improving household production. What exactly this indicates depends on the amount and regularity of cash received from this, and what it is used for, which is not easy to assess from the results. The fact that fishing does not occur within a household on a daily basis whilst there are so many days spent with productive members not conducting an economic activity suggests that it is not an accumulation for development strategy as the benefits are either too small and/or irregular. If they were large or more regular, households may be expected to invest more time in fishing.

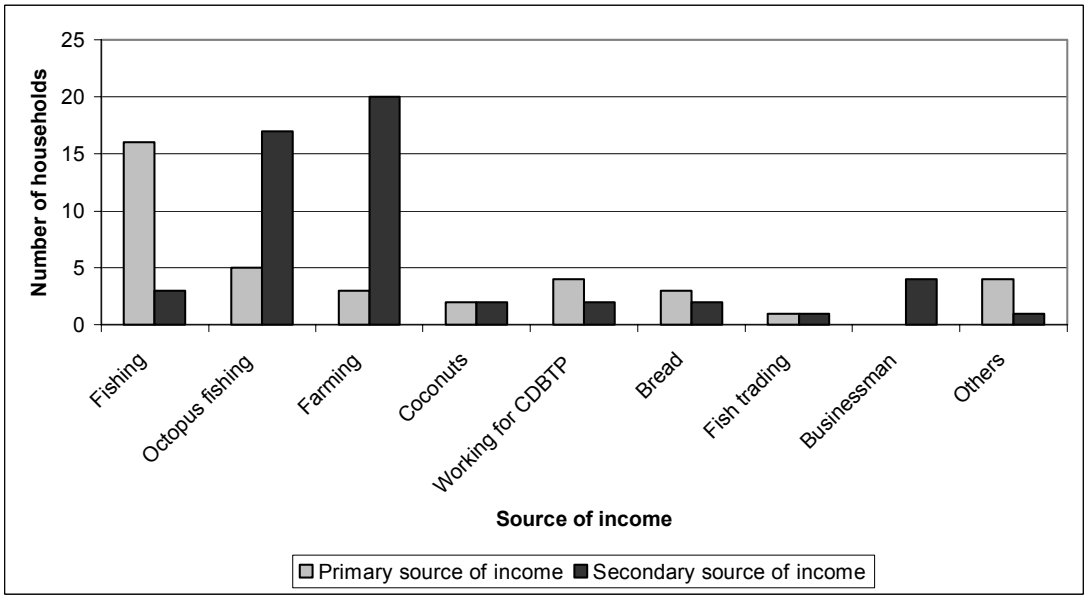

Figure 4.7. The number of households reporting different activities as primary or secondary sources of income (28 households sampled).

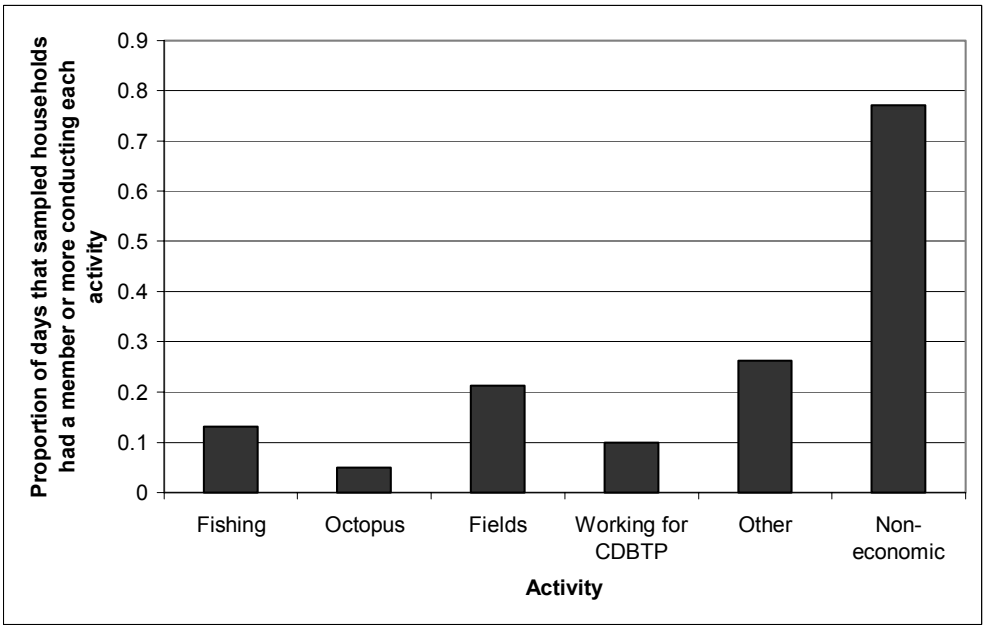

Figure 4.8. The proportion of days households had a member or more conducting different activities (61 days from 27 households, with no household being sampled more than 3 times. Each household could be involved in more than one activity each day).

The subsistence livelihood is not entirely dependent on one economic activity for the majority of households surveyed. Figure 4.9 shows that only one household recorded just one source of income, and most recorded three or more. The household that did only record one source of income was a household that had moved to the village within the last 3 months for the purposes of the husband to work at CDBTP. The other household members had not had time to establish a field, nor had they the skills or experience to participate in octopus fishing.

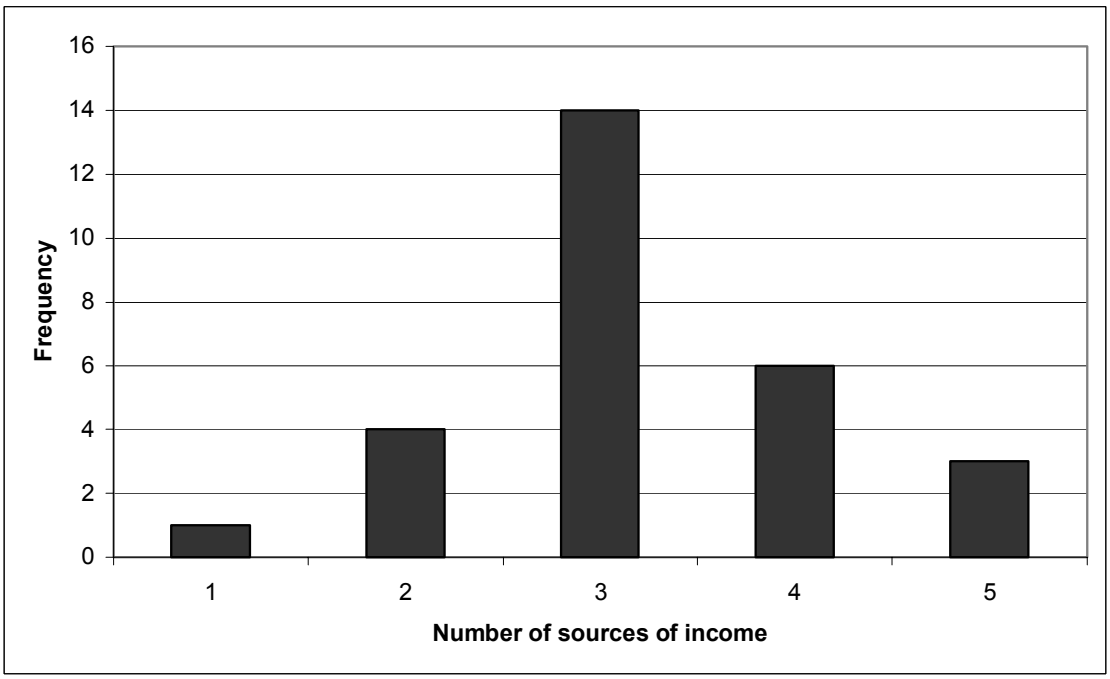

Figure 4.9. The number of households recording different numbers of sources of income. 28 households were surveyed.

The most common form of livelihood strategy therefore appears to be the diversified subsistence strategy. All those who were interviewed who work for CDBTP had objectives to improve their standard of living with the salary they receive, and they, along with the two shop owning household on Vamizi, appear to have a diversified accumulation strategy. Ten employees of CDBTP were interviewed. Of these 10, nine had been fishermen before starting to work for CDBTP. Four had been working for longer than a year. Of these four, three have started or nearly completed building *dhows* out of the salary they are making; one of which for fishing and the others for transport. Of the remaining 10, all stated they wanted to use their money to improve their home or build a new one and were saving some to use for a bigger purpose. What they would use it for depended on the amount they managed to save, but one mentioned buying fishing equipment, and another mentioned an ambition to build a shop. In the cases where members have employment, the accumulation can be reliant on the employment, but the household still requires other forms of production, such as fields or octopus fishing, to maintain itself. Six out of the seven households in the household survey with a member employed by CDBTP recorded at least agriculture and octopus fishing as important sources of

income, with three of them recording one of these two as more important than the salary for the maintenance of the household.

4.4 Resource use

4.4.1 Household production

Household production, also known as income, from different natural resources on the island is summarised across all households in figure 4.5. In section 4.3, it is shown that fishermen do not fish every day, and from the information available, the average household (across all households) may only send a member out fishing once every 8.5 days, and at the most frequent estimate, those households that regard fishing as an important source of income (68% of surveyed households) fish once every 3.7 days. As each household was only sampled on three different days, the average daily production from fishing is therefore likely to be underestimated or overestimated for the particular household concerned. Overestimates will occur where by chance a household recorded fish production on two or three of the three 24-hour sample periods, despite the fact that they normally only fish every 3-4 days. Octopus production may equally be underestimated or overestimated for different households because octopus fishing only occurs for 4-5 days over a spring tide (i.e. 8-10 days a month), suggesting that households would need to be sampled randomly at least 3 times for sampling to even occur on an octopus fishing day. de Merode *et al*. (2004) monitored houses on 56 days to estimate household budgets, as opposed to the three days in this study. This under-sampling for each household reduces the power of statistical tests because variation between households will be higher giving a higher variance. This is emphasised by the fact that two households had an average daily total production of more than US$1 per adult male equivalent. In one of these households, this was due to the fact that the head of the household had been out fishing octopus (by boat with a mask and snorkel) on each day that his household was sampled, despite the fact that he claimed not to go fishing every day. Other households that claim fishing or octopus fishing is an important source of income had not been fishing on any of the days sampled. Another way to increase power would be to increase the number of sampled households. However, a better estimation of true household mean values is

important before being able to accurately determine how many households would need to be sampled to meet power criteria.

Total production from all sources of activity is thought to be underestimated in the household surveys, not only for the reason above, but because of the difficulty in estimating the value of different sources of income. For example, shop owners could not estimate the total value of sales for the period of 24 hours in most cases, let alone the profit they would make. Those who sell bread and/or tea could only estimate the amount they had sold as they had no records. *Nauli* may also be under-recorded for those households owning boats if the *nauli* had not yet been received or sales of fish had not yet occurred as they were being dried or stored. In these cases, boat owners who did not go fishing would not know how much fish had been caught on their craft that day until they had received payment, which may only occur once the fish has dried, or may only be added up every few days or weeks.

For those who work for CDBTP, income is received monthly. How much of that returns to the household is difficult to estimate. For the purposes of this study, the daily income for employees was calculated from their monthly salary. Employees are based at the CDBTP site, only returning home in their time off. Two figures for production were therefore calculated; one only including the daily wage rate for when the employee was in the household during the 24-hour recall (this goes with the same principles as only including work of those household members present due to the difficulties of determining what household members away are producing), and one where the daily wage rate is presumed to return to the household. Figure 4.10 shows the value of different natural resources in household production. The value of total production relating to only those workers present in the household during the 24-hour recall period is used in this graph.

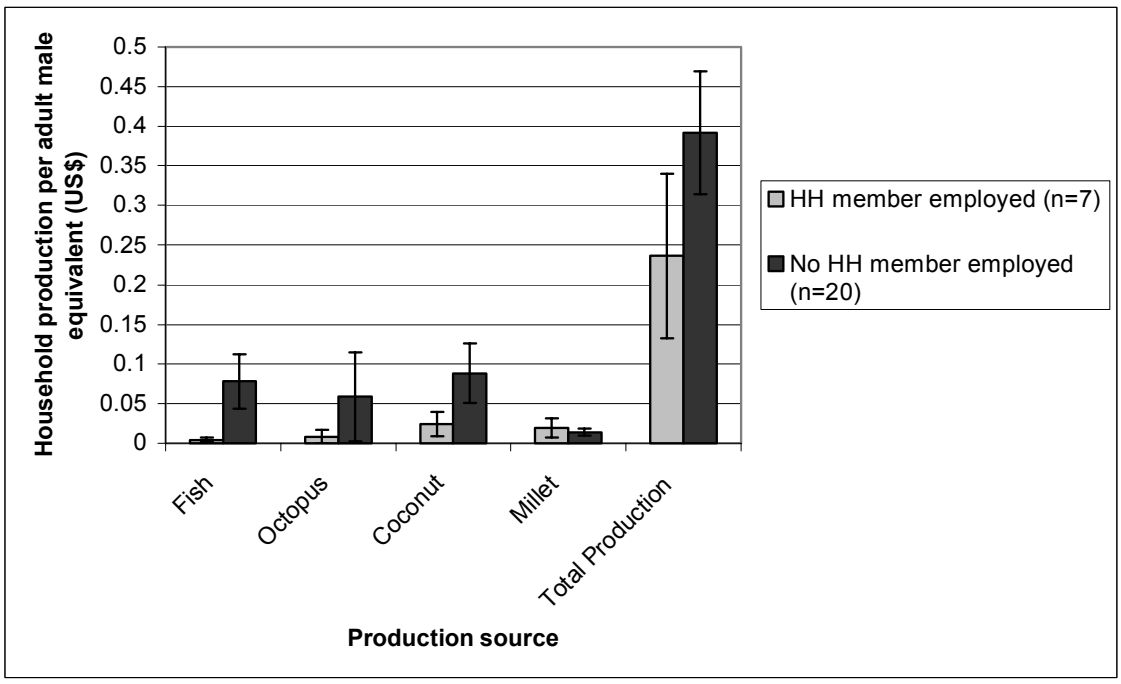

Figure 4.10. The value of different resources in terms of household production for households (HH) with a member employed and households without a member employed by CDBTP. Values represent mean daily household US$ per adult male equivalent, error bars represent standard error. n=number of households.

Figure 4.10 shows the production values to be very low, and the error bars to be very wide. A one-tailed two-sample t-test reveals there is a significant difference in mean daily household fish production per adult male equivalent between households with and without a member employed (d.f.=19, t=2.13, p<0.05). None of the other values differ significantly, and power values are extremely low (table 4.3). Although figure 4.10 only includes salaries for those days where an employed household member was at home, the test for total household production with the daily salary included is not significant. Total production under these conditions (with the daily salary included) for households with a member employed is US$0.572±0.075 per adult male equivalent (n=6: one household with a member employed was excluded because a further employee was staying as a guest for only part of the survey time which distorted the result and created an outlier, see table 4.3 for power).

Test	Power
Octopus production	0.218
Coconut production	0.451
Total production (test 1)	0.306
Total production (test 2)	0.485

Table 4.3. Post-hoc power for single-sided two-tailed t-tests at α-level of 0.05 assuming unequal variance for household mean values of daily production per adult male equivalent between households with and without a member employed by CDBTP. Total production (test 1) represents values where salaries are only included when the employee is present in the household. Total production (test 2) represents values where salaries are included whether or not the employee is present in the household.

Figure 4.11 shows production for households in the different wealth groups established from the household asset surveys. Households with members employed are not included in this figure. Due to the limitations in the wealth grouping methods (see section 4.2.2) these results are merely a guide and no statistical tests were conducted. The apparent decline in total production as wealth declines indicates support for the wealth groupings. Although production is not accurately estimated, the degree of underestimation is probably more severe for wealthier households as it is these households that own the shops and production capacity (such as boats), further supporting the wealth groupings. On the other hand, wealth groupings were based on household assets that determine productivity (i.e. ownership of boats, coconut palms etc). All but one of the households with members employed, although not included in this figure, actually fall into wealth group 3. This suggests that production in these households may have been low even before a member of the household was employed.

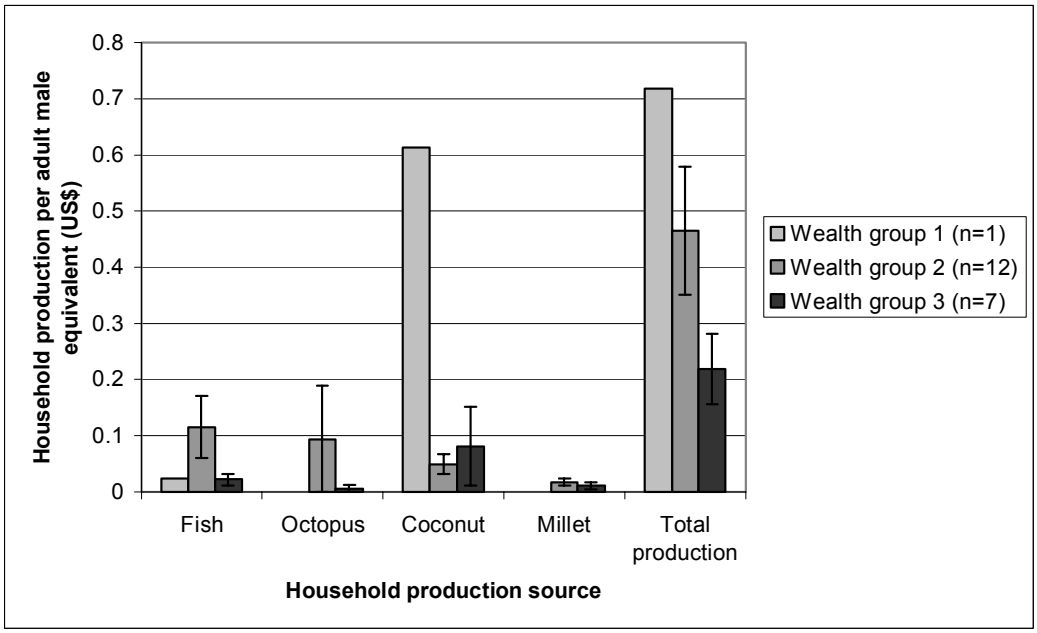

Figure 4.11. Household production for households in different wealth groups. Wealth groups are based on household assets. Values represent mean household US$ per adult male equivalent. Error bars represent standard error. n=number of households.

4.4.2 Household consumption

Consumption is generally taken as a preferred indicator of well-being in many applied studies (Ravallion, 1992). For the purposes of this study, total consumption may well be a better estimate of well-being than total production due to the uneven distribution of income through time as discussed above. Consumption may smooth this out a bit as it occurs daily and comes not just from the same day's production or income, but from savings of previous days income. The number of repeats necessary to generate a reasonable estimate may therefore be expected to be lower than for that of production. The practice of meal-sharing between households complicates the measure of what is actually consumed per person in the household. However, the data recorded were the resources that the household itself prepared for consumption, independent of how many people shared the same food and whether household members ate with other households before or after. In this way, consumption may be a better indicator of well-being as those with more resources have the ability to prepare larger quantities of resources for consumption.

Figure 4.12 shows the value of different resources in household consumption for households with a member employed and for households without a member employed by CDBTP. It also shows total consumption.

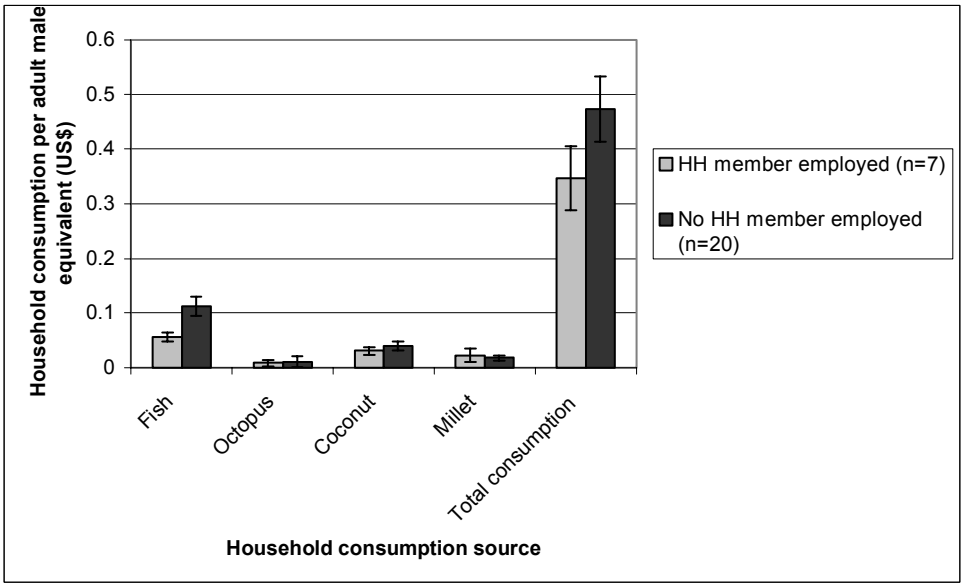

Figure 4.12. Daily household consumption for households (HH) with and without a member employed by CDBTP. Values represent mean US$ per adult male equivalent. Error bars represent standard error. n=number of households.

Figure 4.12 suggests that average total daily consumption per adult male equivalent for households without a member employed by CDBTP may be lower than households with a member employed. A one-sided two-sample t-test shows the difference is not significant, although the power of the analysis is only 0.420 for a one-tailed test at an α-level of 0.05. This low level of power is due to an insufficient sample size and the degree of variability shown by households. An increase in the number of samples per household may help to increase the power by potentially smoothing out consumption per household similar to the situation described for household production.

Daily household consumption per adult male equivalent of fish, however, is significantly lower for households with members employed by CDBTP than for households without (one-tailed two-sample t-test with unequal variance: d.f.=24, t=2.88, p<0.01) . This may in part be related to actual household size. Households with a member employed by CDBTP appear to be larger than those without (mean for HH with employed member=4.40$\pm$0.56 adult male equivalents, and for HH without=3.52$\pm$0.38 adult male equivalents), but this is not significant in a one-tailed two-sample t-test although power is very low at 0.34. Total consumption does correlate negatively with adjusted household size (figure 4.13), with regression analysis producing a significant result (d.f.=1,

F=9.67, p<0.01) and showing that adjusted household size (number of adult male equivalents) explains 24.3% of the variation in household consumption per adult male equivalent. A similar analysis for fish consumption produces a significant result (d.f =1, F=10.08, p<0.01) and shows that adjusted household size accounts for 25.2% of the variation in household fish consumption per adult male equivalent. Previous studies have found adjusted household size to explain variation in consumption per adjusted equivalent and suggest it is due to economies of scale (Mwisomba & Kiilu, 2001; Gould & Villarreal, 2002). This was supported in the household surveys as households buying 1kg or more of fish most frequently spent Met 8,000 per kg or less, whereas those households that bought 0.5kg of fish most frequently paid Met 5,000 for half a kilogram (so Met 10,000 per kg). There does not appear to be variation in the consumption of octopus, coconut or millet. This may be because these goods are most frequently foraged rather than bought, and therefore economies of scale do not apply in the same way (the same monetary value is given per quantity) (see figure 4.5).

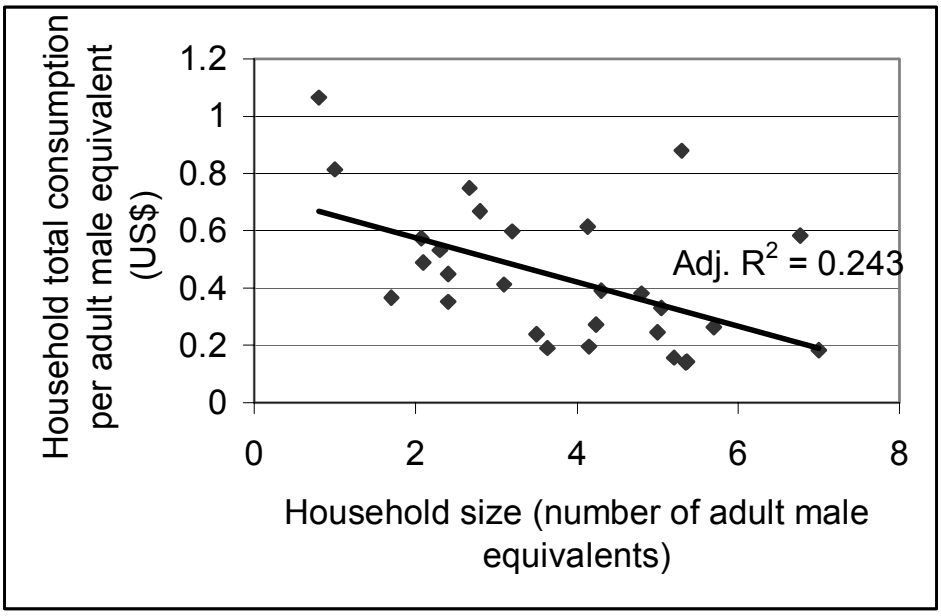

Figure 4.13. Relationship between household size and average household total consumption.

Figure 4.14 shows household consumption for the different wealth groups for households without members employed by CDBTP. Interestingly, unlike for household production, there is very little difference in average household consumption between groups. This goes against expectation as actual consumption should increase with income, even if the budget share spent on

food consumption decreases with increasing income (Engel, 1895), and especially if consumption is assumed to be a useful indicator of well-being (Ravallion, 1992). This unexpected result may be due to traditional styles and ways of eating, meaning that the same ingredients are generally used – which raises the question of why household consumption may be lower for households with a member employed than for households without. It may be influenced again by household size. The one household in wealth group 1 has 6.77 adult male equivalents (n=1), and wealth groups 2 and 3 have (mean±standard error) 3.46±0.42 (n=13) and 3.15±0.67 (n=14) adult male equivalents respectively. Wealth groups 2 and 3 do not differ significantly in average household size using a two-sample t-test, and although household size for wealth group 1 is high, there is only one household in this group. Therefore, wealth group does not appear to be influenced by household size, suggesting that wealth group is not as good a predictor of household consumption as household size is. This may also explain why household consumption varies between households with members employed by CDBTP and households without.

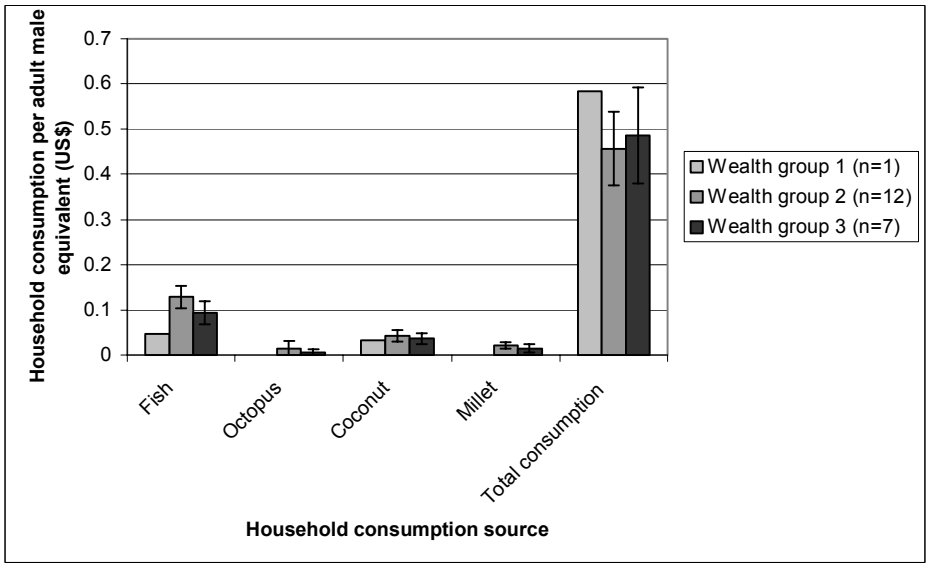

Figure 4.14. Household consumption for households in different wealth groups. Wealth groups are based on household assets. Values represent mean household US$ per adult male equivalent. Error bars represent standard error. n=number of households

4.4.3 Household purchases and sales

Figures 4.15 and 4.16 show household purchases and sales for households with and without members employed by CDBTP. Differences between

households with members employed and households without members employed by CDBTP for mean daily total purchases and fish purchases per adult male equivalent can be tested, but a one-sided two-sample t-test does not produce a significant result. The very low power (power is 0.158 and 0.088 respectively) is due to the high level of variability and low number of sample sizes. Figure 4.15 suggests that mean total purchases may be higher for households with members employed than for those without. If this is the case it may represent an increased purchasing power from salaries returned to the household, and maybe a requirement for increased purchasing due to loss of a previously productive adult in terms of harvesting of natural resources.

This is supported by the suggested lower value of sales for households with members employed by CDBTP (figure 4.16); perhaps due to the loss of a productive adult who was previously fishing. However, a Kruskal-Wallace test for difference in median household sales of fish for households with and without a member employed revealed no significant difference. However, the number of zeroes is very high, and more sampling may be required before a difference can be detected. Mann-Whitney U test could not be used due to the high number of zeroes. Neither a Kruskall-Wallace nor a Mann-Whitney U-test produced a significant difference for medians or average ranks (respectively) of household sales of octopus, coconuts or total sales. More sampling may be required to overcome the large number of zeroes for any of these tests to show a difference in household sales. The graphical indication is therefore a better indicator of differences in household sales. Of the nine people employed by CDBTP who did not move to the village for the purposes of the job, eight were fishermen before they were employed. These households effectively lost a fisherman to employment, and therefore may require to purchase more to feed the rest of the family from salary the employee sends home. In section 4.4.2 it is mentioned that households with a member employed tend to have larger households, which may mean more producers, and in some cases it does. However, it can also mean more children who are not producers.

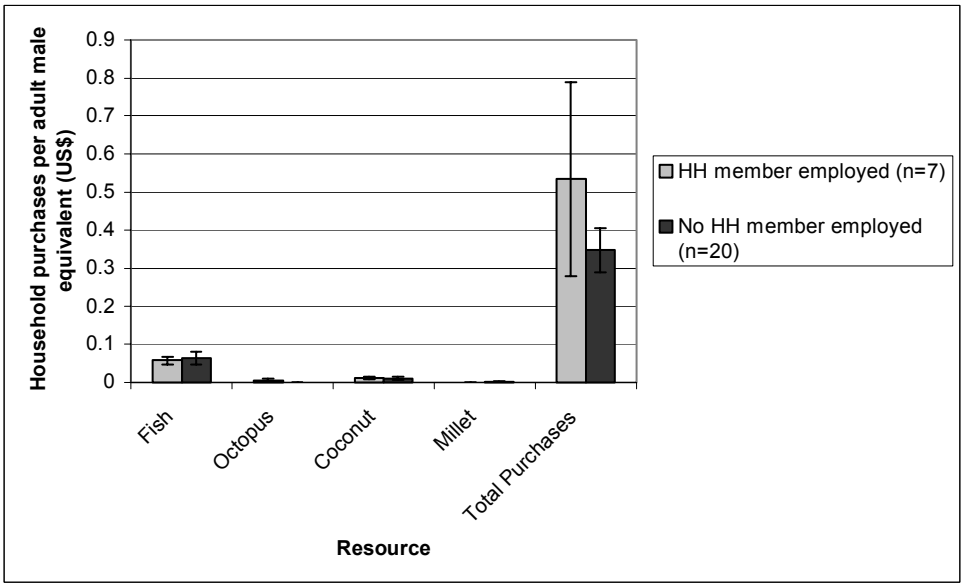

Figure 4.15. Household purchases for households (HH) with and without a member employed by CDBTP. Values represent mean US$ per adult male equivalent. Error bars represent standard error. n=number of households.

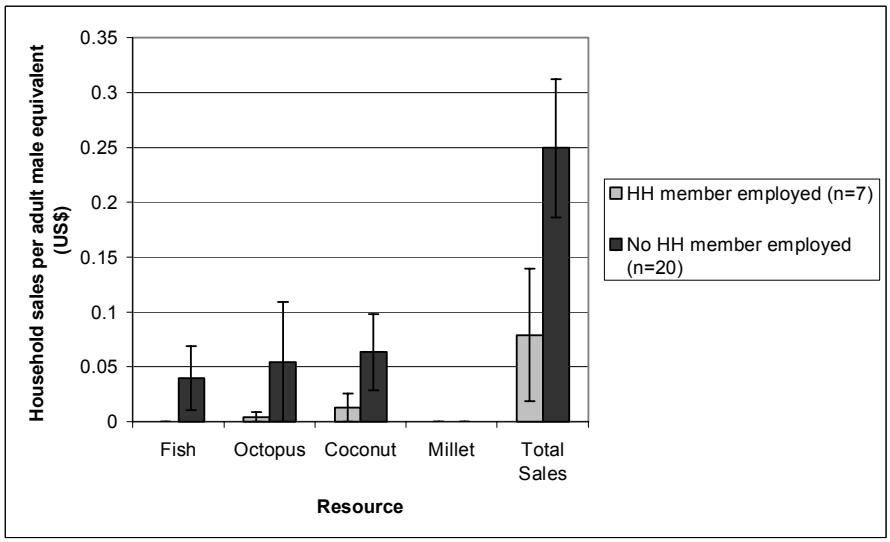

Figure 4.16. Household sales for households (HH) with and without a member employed by CDBTP. Values represent mean US$ per adult male equivalent. Error bars represent standard error. n=number of households.

Figures 4.17 and 4.18 show the household sales and purchases for households in the different wealth groups, not including households with a member employed by CDBTP. Wealth group appears to have little effect on purchases, while total sales appear to decrease the lower the wealth group. This may reflect the productive capacity of higher wealth groups with larger assets, although there is considerable variation within wealth groups.

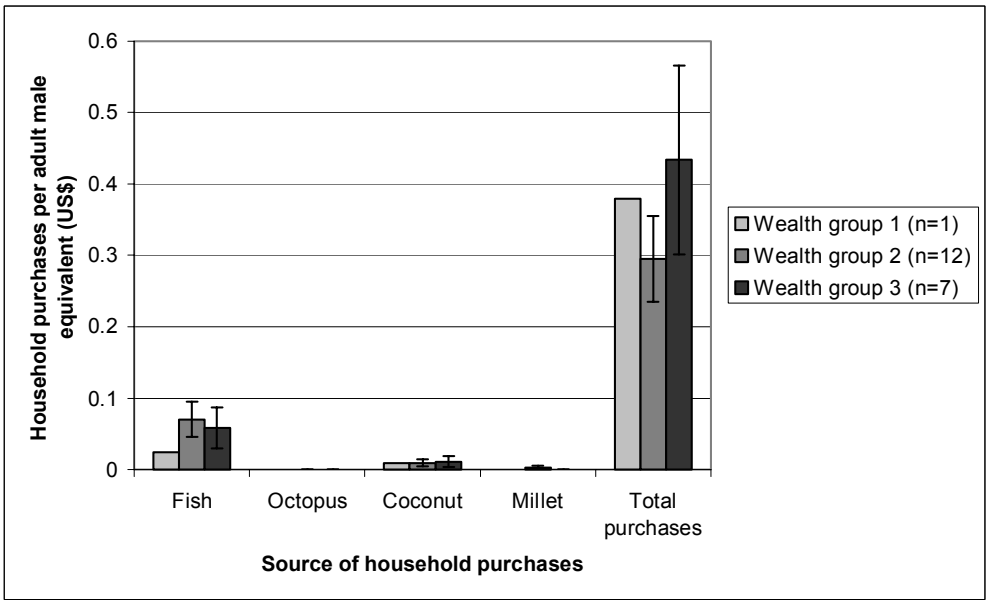

Figure 4.17. Household purchases for households (HH) in different wealth groups. Wealth groups are based on household assets. Values represent mean household US$ per adult male equivalent. Error bars represent standard error. n=number of households

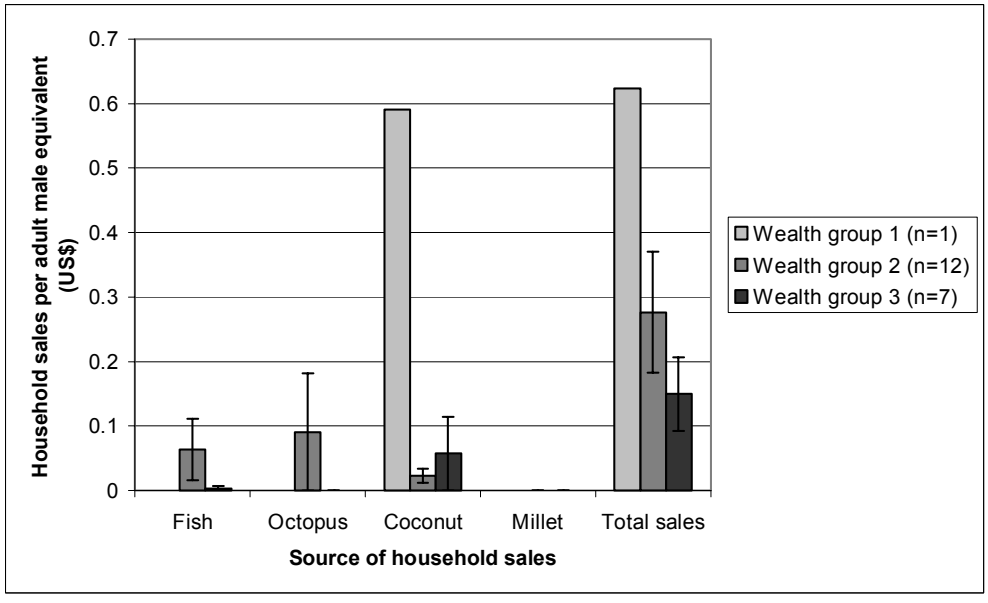

Figure 4.18. Household sales for households (HH) in different wealth groups. Wealth groups are based on household assets. Values represent mean household US$ per adult male equivalent. Error bars represent standard error. n=number of households

5. DISCUSSION

5.1 Introduction

Limitations of the study prevented the collection of sufficient information to produce definitive and quantitative answers to the questions initially asked in this study. However, some valuable insights into the role of marine resources within villagers' livelihoods emerged, together with some information that may help to determine the likely effects of employment at the household level and some possible consequences for marine resource use and conservation. This section draws heavily on frameworks, terminology and theoretical background presented in the literature review as well as on the results of this study.

5.2 Livelihoods

Although it was not possible to estimate total household production accurately, the mean daily production per adult male equivalent was well below the standard poverty line of US$1 per capita per day (see figures 4.10 and 4.11). Two households did have a value slightly above this poverty line, neither of which had an employed member. If salaries of all household members are included, even if not permanent and not present in the household, one other household had a higher value, but this household included a visitor for one of the three sample days who works for CDBTP and earns the highest salary of all the workers. These results may be an overestimation for the households concerned due to the sampling technique.

5.2.1 The role of marine resources

Although total production was most likely underestimated, the results that were obtained suggest that fish and octopus do not form a large component of the total household production (figures 4.10 and 4.11), nor more than half of the household sales (figure 4.16).

This is at odds with the results of the SSIs, which showed fishing, octopus fishing and farming as the main primary and secondary sources of income. Most interviewees regarded themselves as fishermen, and yet the number of days spent fishing is surprisingly low. This may indicate the role of fishing in establishing a sense of identity which has been noted elsewhere in Cabo Delgado (Wilson *et al.*, 2003).

Production from coconut palms is roughly equal to the income of fishing and exceeds that of octopus fishing (figure 4.5), although very few households seem to record it or regard it as a source of income (figure 4.7). Other productive sources recorded during the surveys included the making of bread and the opening of shops.

Figure 4.5 demonstrates the importance of fish in terms of household consumption as more is bought than is produced. The role of fish as a source of nutrition is therefore very important within the household, especially given the lack of alternative sources of regular affordable protein. This is in part due to the distances involved to other markets and the lack of capacity to keep foods fresh. Fish may also be very important culturally as a traditional food. It is also an important source of income as is demonstrated by the amount of fish that is sold out of a catch (figure 4.6).

This research supports Smith *et al*.'s (in press) contention that the 'old paradigm' is insufficient to explain the role of fisheries in livelihoods. On Vamizi, fishers may fish because there are few other alternative sources of income, not simply 'because they are poor' (Béné *et al.*, 2000). Agriculture does not provide a source of cash, and at best only provides a few months or maybe a year of one staple food. There are also few large markets for products other than fish on the island as traders arrive to buy fish for resale and very little else. But by no means all households are solely dependent on fishing - fishing forms part of a diversified strategy; whether as a subsistence or accumulation strategy.

Smith *et al.* (in press) note the complementarities between fishing and farming. Fishing is an activity that is done on a part-time or even passive basis. They note that people may be attracted to fishing due to its high returns relative to costs, and that the labour opportunity costs of part-time fishing, passive fishing, or fishing at night are much lower than may be expected given the return of other activities. In this way, fishing can be seen as an 'opportunistic endeavour' (Smith *et al*., in press) to which effort can be allocated flexibly according to the inputs available and in response to returns made, leaving time and opportunity for pursuing other economic activities. This may indicate why fishing does not

occur very regularly in most households on Vamizi. However, whilst one would accordingly expect household members to be spending time on other economic activities, this does not appear to be the case (figure 4.8). This may be explained by economic activities not being sufficiently recorded, with people carrying out activities that they do not regard as having economic return, but which result in economic return a few days later. Also, household members who were not present for the day did not have their activities recorded as often their activity was unknown by the respondent or they may have been involved in some economic activity that takes a number of days away from the household. Some households could, in fact, not be recorded at all as all members were away for a few days. During this time they could be conducting economic activities and then when they return, spend some time resting and using the income they made. Unless they were re-sampled again within 24 hours of returning, this would not have been recorded. These sorts of problems should be taken into consideration when conducting future research and monitoring, and an attempt to identify and even quantify the amount of "off-site" production should be made. Sampling households continuously over an extended period of time (i.e. through the use of household diaries) or a high enough number of repeats of each household may ensure a more complete understanding, enabling activities that produce large amounts of income but on an irregular or infrequent basis to be captured.

The arrival of more people on the island for fishing and also the employees of the ecotourism may have created more alternative sources of income than there were in the past. Some of these people will have higher spending power due to the high price of fish or the salary from employment. They may also create a demand for goods they cannot produce themselves having arrived recently. For example, 'Immigrant' fishermen coming to the island will need coconut products for cooking and building, creating a larger market there (reflected in figure 4.5 as coconuts have the highest sales value). This may not be recorded by households in a daily activity budget as little effort is required.

If marine resources are declining, as is suggested, due to the arrival of so many fishermen with better gear and more destructive techniques, this could further push people of Vamizi village to reduce the amount of time spent fishing in

order to make more of these alternative economic opportunities. This could be because catches are perceived as declining; that the perceived risk of returning from fishing with nothing is higher (therefore confidence in the resource is low); or that the perceived opportunity to experience a windfall catch is decreasing. All of these could be caused by a lack of capital to allow local people to specialise in the face of increasing competition with outsiders. However, as there is a good market for fish, it can still provide a ready source of income when required. In this way, it may be used as a 'buffering' mechanism (Smith *et al*., in press) when alternative sources fail to meet requirements. It is therefore possible that there has been a gradual shift away from a survival strategy that may have occurred sometime in the past, to a more diversified strategy making the most of new alternative sources of income. However, fishing is always likely to form some part of the livelihood strategy for the majority of households, albeit as a part-time activity, if only to provide nutrition and a source of protein, or as a buffering mechanism and ready source of cash to contribute to the smoothing of income and consumption rates and risk management. This apparent shift in the emphasis of certain activities in livelihoods may have taken place recently if it has occurred at all, which may help explain why so many still regard themselves as fishermen and of fishing being such an important source of income.

Octopus is purely a source of income or cash, perhaps due to the high prices and demand that have come recently to the island. It is also a part-time activity that can have a high cash return. Although in the past it was eaten, the high value now means that it can in effect be exchanged for higher quantities of fish or staples as required so the monetary value of the catch is more valuable to octopus fishers than the nutritional value. The role of octopus fishing in households varies depending on household characteristics, from a last resort for those households with few alternative sources of income, to potentially fulfilling a social function or providing a source of cash for members of the household who may not benefit as much from other primary sources of income. There is a recognition that differences in 'bargaining power' may exist between members within a household which may lead to differences in the apportionment of resources for consumption (Ravallion, 1992; Poulton *et al.*, 2001), especially in this Muslim and male oriented community. Octopus fishing may be an activity that provides women and children with an extra source of

cash to help mitigate these differences, or substitute for the shortfall in the apportionment or resources. The part-time nature and low opportunity costs of octopus fishing also make it an attractive form of extra cash. It is complementary with farming, and therefore for some households may just be a regular opportunistic endeavour.

For those households without men, who therefore have access to fewer forms of income, octopus may be very important. These households may be more vulnerable to shocks such as during poor harvest years (such as this year), or for example last year when a disease prevented coconut growth and killed many trees. Its extremely low entry cost both in absolute terms and relative to other activities makes octopus fishing particularly important as a last resort in these situations, and there were households that reported going hungry towards the start of the new *somana* when octopus fishing could start again. The decrease in octopus catches should therefore be of particular concern. Outside of these times of shock, the regularity of spring tides when octopus can be fished may provide an important buffering mechanism as with fish as discussed above.

A very interesting observation from this study is the practice of sharing meals between households. This may well be some sort of consumption smoothing mechanism undertaken by households most at risk of production failure.

5.2.2 The effect of employment

The results indicate that marine production and sales of marine resources are lower per person for households with a member employed than for those without (figure 4.11 and 4.16). This may be because employment has removed an active fisher from the household (nine of the 10 interviewed employees from the village had been fishermen before they started working), or it may be because dependence on marine production has decreased and economic substitution has taken place. In support of economic substitution are the results for the total household purchases, which suggest that households with a member employed purchase more than households without. The error bars on this figure (figure 4.15) are very wide, however, suggesting more data would be needed to substantiate this claim.

The counter-argument is provided by household consumption (figure 4.12). Total consumption appears to be lower and consumption of fish is significantly lower for households with a member employed than for those without. This suggests that these households do not have the resources to consume at the same levels as households without a member employed. This may be because the ability to access resources has decreased with the loss of a fisher or other productive adult and the quantity of money they receive from the employee's salary back in the household does not sufficiently compensate for this loss. It has been noted from other studies that money made by men outside of their subsistence activity is actually spent on consumer durables and/or alcohol rather than returning into the household, as noted in the literature review (Poulton *et al.*, 2001). Therefore it appears that employment has not contributed to development of the households concerned, especially if consumption per capita is used as a poverty indicator. Whilst discussing this, it is worth noting that even if the data were significant, it is not possible to prove cause and effect. It is merely speculation based on the available evidence as consumption may have remained the same since before the member of the household was employed. Most of the households with a member employed fall in the poorest wealth category based on household assets, but no effect of wealth category on household consumption has been observed. Household size has a greater effect on consumption rates than does wealth group. Households with a member employed surveyed in this study may have a larger household size, but the result is not significant. Consumption may therefore not be a good indicator of well-being for the purposes of this study. It does seem reasonable to assume that dynamics within the household have changed since a member has been employed. Even so, one may expect that a significant enough increase in available money would increase the consumption of households, but any increase, if there has been one, does not appear to have reached the level of other households. The fact that some households with members employed did not record the salary of the employed member as the most important source of income to the household suggests that there is insufficient income returning to the household and that these households are struggling to maintain consumption levels.

The results may, however, reflect short-run response as household members have only been employed for a maximum of two years, and many had been employed for only a few months. All interviewed employees stated they were saving part of their money for different reasons; some to improve their houses, some to invest in boats or a shop, and others for when their employment finishes. Even the longest-term employees had not completed building their *dhows* as the investment and time required is so large. In the long run, once these investments are complete, we may see that they create a larger return to the household and a reversal in this consumption pattern as households complete a transition to a diversified *accumulation* strategy. In the meantime, this investment may be causing a diversion of income away from daily consumption.

However, it is anomalous that, given the open access of a resource such as octopus fishing, we do not see similar levels of octopus production and sales between households with and without employees. Given that "employee" households are not at similar consumption levels to those without members employed, it may be expected that remaining members of employee households would continue to participate in octopus fishing. Even if households were receiving sufficient income from the employed members, the opportunistic potential for octopus fishing must provide an incentive to participate. This behaviour is difficult to explain. It may be a result of sampling, where sampling days did not correspond with periods of spring tides. Another possible explanation is that households are adjusting to having a new source of income in the short-run. It could be a status symbol that they do not need to participate in octopus fishing, or it could be a short-run belief that employment will mean that everything they require will be provided without the need to continue with traditional activities: a sign they are now well-off. Households with members employed did tend to fall into the poorest wealth category based on household assets, so they may not easily fit into an accumulation strategy as their mind-set may previously have been to produce enough to survive. A look at whether there is an actual difference, what the cause is and whether it continues in the long-run would be an interesting area of further study.

5.3 Conservation

5.3.1 General resource pressure

On the sort of casual basis that fishing appears to occur, it seems unlikely that fishing by villagers will create a heavy pressure on resources. As it appears to be part of a diversified subsistence strategy and is not done every day, the pressure on the resource is likely to be smaller than if everyone was fishing every day or if it was a 'survival' strategy or part of a diversified accumulation strategy and important for providing profit. However, no stock-assessment was undertaken in this study, so this is purely speculation.

Results from SSIs suggest that fish resources are, in fact, declining, and villagers put it down to the increasing number of fishermen who are coming specifically to the area to fish. These people generally have better gear and there are many of them. They may better fit the 'old paradigm' that they fish because they are poor as they have left areas where they have access to few other economic alternatives (we can postulate that if they did have access to alternative sources of income they would have remained) and their local fish stocks are decreasing to the point that they have needed to move on. The alternative is that these fishermen are actually making a better profit from specialising in fishing on Vamizi, and the move is actually driven by a specialised accumulation strategy. Without studying these communities in more detail it is difficult to assess which of these is the principal reason for the increasing number of people arriving on the island.

The harvesting of octopus resources on the other hand may be under more pressure from villagers than fish resources given its extreme openness in nature and the variety of different roles it can and could supply. It is impossible to tell whether this pressure is significant enough to have an effect on octopus populations as there is no quantitative stock assessment. Octopus populations are reported to be declining and in a worse state than the fish resources. The decline is reported to be due to the increase in the number of fishermen coming to the area. The same arguments for fishing given in the above paragraph apply here. However, octopus fishing is the most open access of the resources with no economic barriers to access, and given the higher price of octopus than fish, the incentive is there to harvest the resource as much as possible. This

fundamental difference in access to the two resources could help explain any difference in pressure on the resources.

5.3.2 The effect of employment

In section 4.3, it is recorded that nine of the 10 interviewed employees originally from Vamizi had been fishermen before going to work for CDBTP. Allison & Ellis (2001) note that the mobility of livelihoods between fishing and other sectors is not necessarily a substitution between full-time occupations (section 2.1.3). In this case study, the livelihood of an individual who works for CDBTP may well involve a full-time substitution of activities, or near enough, because there is little time available for that individual to fish. This may represent a conservation gain. However, it does not represent a full-time substitution for the livelihood of the household concerned, which has other members who may be able to replace the role of the former fisherman or be able to devote more labour time to fishing. In section 5.2.2 it is discussed that marine production does appear to be lower for households with a member employed than for households without. This may therefore represent an economic subsistitution that could be a conservation gain.

In section 4.3, we see that only two of the ten employees interviewed reported that they were investing or wanted to invest money into the fishery by building a boat or buying fishing equipment. Two others had started building *dhows* for the purposes of transport. Taken together with the arguments above, this suggests that contrary to the arguments reported in the literature review (section 2.1.3), employment by ecotourism may not dramatically increase the pressure on marine resources from these households through investment in better fishing technology and an attempt to overcome the 'economic exclusion' of resources. Some people may increase their fishery productive potential, but others may invest in alternative sources of income (such as transport, shops) or make the most of other growing economic opportunities in the area. This effect may be amplified by the increasing number of fishermen coming to the area which, whilst they are perceived to be causing a decline in fish catches that villagers cannot compete with, may provide further economic opportunities in other activities through the increased demand they represent. Further to this, the high number of fishermen means that there is a plentiful supply of landed

fish for purchase if households have the disposable income to be able to do so. Therefore, making sufficient amounts of money in other economic areas may be perceived to or actually outweigh a reduction in fish production capacity by these households, and suggests that in this case employment does not and may not cause an increase in pressure on marine resources, albeit only from those households concerned. However, the presence of such a high number of fishermen does suggest that the relatively low number of households potentially experiencing economic substitution through employment may not amount to a particularly large conservation benefit – i.e. the conservation benefit is eroded and limited.

This creates an interesting paradox: households enjoying income from a salary may move away from fishing in part because of the increasing number of fishermen and the perceived reduction in return for their effort. If the increasing number of fishermen were not there, would households with income from a salary still move away from fishing? If there were fewer fishermen and the resource was not declining, would those households not invest more into fishing production capacity? Is conservation in fact therefore being achieved through employment by an ecotourism operation, or is economic substitution of the households concerned due in part to the increasing number of fishermen and a de facto failure of conservation? Further research and monitoring will be required to test these questions.

It is interesting to note that the attraction for immigration to the area may come more from the natural resources and fishing potential than from development per se and the opportunity of employment. Other studies have noted the problem of ecotourism not generating sufficient benefits to outweigh the influx of outsiders who are attracted by the employment potential and the dilution of the benefits as a result (Kiss, 2004) (see section 2.2.5). There is a large influx of people to the area because of the potential for fishing and the state of the resources in comparison to other areas of Mozambique, as evidenced by the growth in the fishing camps. Also, these people remain largely separated from the main community. This increase in fishermen is something that should be addressed if the ecotourism is to maximise its conservation effect, and may actually be an issue for other ecotourism operations. Ecotourism is generally

likely to occur in natural or pristine areas, which may be attractive to people from other areas where resources are not so plentiful. When ecotourism is establishing in areas where there has been no previous tourism, improvement in transport and greater links between populated and remote areas may increase the immigration to the area for the purposes of the natural assets. This may be exacerbated in some instances by the attraction of these areas from a perceived improvement in employment potential.

At the fishing camps on Vamizi Island, immigration to the area has not apparently been for the purposes of job seeking from the ecotourism development as there is only one employer with a limited number of jobs, and people report arriving for the purposes of fishing. This may be explained by the way CDBTP sources employment. The use of a CLO who takes opportunities to various nearby communities spreads the availability of jobs across a wider area and provides little incentive for people to move near to the development. The attraction of the natural assets is therefore the greater attraction to the area.

Addressing the issue of increasing numbers of outsiders (potentially by limiting it or actually reducing the number of outside fishermen) may lead to an increase in the amount of fishing by households within the village if they perceive an increase in fish catches and find the traders fighting for the fish they can produce (due to the high demand in areas such as Nacala). It may also lead to a resurgence in fishing to some extent because the availability of fish to purchase may fall as demand from traders is sustained and the local price of fish increases beyond that of local means, and the alternative economic opportunities provided by the currently increasing number of people (i.e. sales of coconuts as discussed above) would not continue to expand and could potentially decline.

The future level of marine resource use by households may depend in part on how many people remain employed by CDBTP. Once construction work is complete the number of jobs available is likely to decrease. If this means that a number of employees are laid-off and return to the village, the money they have saved may be used to purchase more fishing gear and improve their productive

capacity as they may have to return to fishing. It is important to note that the presence of CDBTP has not necessarily raised the opportunity costs of fishing for non-employees in terms of lost employment potential. There are only a limited number of jobs available, and for those who do not have jobs, there are few other opportunities for making money from CDBTP directly. Opportunity costs may have risen slightly in the area as a result of the increased number of people in the area (employees at the CDBTP site and fishermen at the transient camps) and the potential for other economic activities related to this influx, and possibly due to the increase in spending power of employees. If many are laid off or move away from the area (whether or not they are from the village), these alternatives may become saturated, as there are fewer employees with spending power coming to the village.

From the information gleaned, it seems plausible that the employment and economic benefits of the ecotourism operation may be providing some level of economic substitution of fishing (Wunder, 2000) for those households with a member employed in this case study. This cannot be definitively proven from this study, although use of marine resources does appear to be lower for households with a member employed, and a number of employees suggest that they will take the opportunity of a salary to invest in alternative economic activities. However, the extent of the benefit to conservation remains to be seen. Whether this continues to be the case for the future will depend on the relationship between the village and CDBTP.

5.4 Recommendations for CDBTP

Recommendations are made for how the contribution of ecotourism to poverty alleviation and conservation in the specific instance of this case study may be achieved. Conservation and poverty alleviation are not considered separately because the issue under consideration is specifically how economic substitution can affect conservation. This by definition will have to impact on poverty alleviation as economic substitution must provide increased benefits to traditional activities if it is to work (Salafsky *et al.*, 2001). There is a growing canon of literature provided by Pro-Poor Tourism (PPT) and other bodies for how ecotourism and tourism in general can increase the benefit that is seen by

local communities (see section 2.2.3). This literature is not repeated, but specific recommendations are made relevant to this case study.

The recommendations largely relate to improving the link between CDBTP and the village: increasing the multiplier effect of tourist spending and backward linkages (see section 2.2.3). Given that employees appear more willing to invest in alternative economic activities with their salaries than in fishing equipment, and the diversified strategy of most households, an improvement in the market for alternative goods that the village could provide would encourage and enable more residents to reduce their dependence on fishing and increase their income from alternative activities. An improvement in the market for alternative goods could be created by an attempt to source a larger variety of goods from the local communities such as coconuts and arable crops in particular. Soils on Vamizi are reported to be fertile, but goats are a problem for many crops. An attempt to work with the local community to improve husbandry techniques that keeps goats and sheep away from crops may enable some enterprising individuals to attempt to grow some crops required by CDBTP. As well as this, traditional foods, such as millet, cooked in a traditional way as a cake or with rice, could be added to the menu for tourists.

When tourists start to arrive, the creation of mechanisms for enabling the sale of local goods to tourists as memorabilia may open another alternative economic opportunity, especially for women who traditionally make local "*esteiras*" (mats). *Esteiras* are very rarely sold within the community as most households make them for their own use. They take a long time to make, but even elderly women who are very restricted in their wider activities, do this on a daily basis. This would give an added opportunity or activity for the subsistence portfolio to households of elderly people or those without men who may be the most vulnerable to shocks and disturbance. This may not contribute directly to conservation, but it may relieve some of the pressure on octopus fishing.

A more formal and regular contact could be facilitated between employees of CDBTP and the community. This could be done through the organisation of a market-place between the village and the ecotourist settlement where workers can go to buy goods after work, or to send back money to their households.

Perhaps most importantly, the issue of immigration to the island should be further addressed. If the area is to continue to hold a high value as a natural attraction to tourists and to provide important livelihood functions to local people, the causes of immigration need to be established (i.e. the livelihood strategies and objectives of transient fishermen). An important side-issue (in terms of CDBTP) is the importance of fish from the Vamizi or Querimbas area in the nutritional requirements of Nacala. If fishing around Vamizi was reduced, how would this impact the nutritional balance of Nacala, given that fish resources in the area are so depleted that fishermen have to come further afield?

Research into the origins of the incoming fishermen and their livelihoods should be conducted, thus enabling the identification of mechanisms to address the issue, which the ecotourism operation can assist government and local authorities to implement. These mechanisms may need to address the availability of economic alternatives and resource degradation at the migrant source or may require the control or restriction of access to fishing in the study area through traditional 'command and control' instruments or economic incentives (such as taxation or entry fees). Which approach will be most successful will only become apparent when the causes are understood. If these issues are to be addressed, it is very important that the above-mentioned alternative economic activities are implemented to make up for any lost or reduced sources of income so as to maximise the benefit to conservation.

6. CONCLUSIONS AND RECOMMENDATIONS FOR RESEARCH

The limitations of this study mean that few firm conclusions can be drawn about the effect of ecotourism on livelihoods and the consequences for marine resource use. However, the study has given some interesting and useful insights into the role of marine resources in the livelihoods of the communities involved, and a livelihood framework has enabled the identification of some useful information that may assist in determining how employment in ecotourism affects these livelihoods and the consequences for marine resource use and conservation.

The study provides support for Smith *et al*.'s (in press) contention that the 'old paradigm' of 'fishery = poverty' is not sufficient to explain fishers' livelihoods. The study shows that fishing is part of a diversified livelihood strategy for all the households involved. Fishing may play an important role in providing the people who are involved in the activity with a sense of identity, but it is not always the most important contributor to household production or income. Fishing appears to play an important role in the 'buffering' of many households' livelihoods. With access to a wide market for dried fish, fishing is an important source of cash for subsistence, and with few alternative and affordable sources of protein, it is important for nutrition. The most open access of fisheries in this case study, the octopus fishery, with no economic or social barriers to entry, plays a range of roles in people's livelihoods, from being an activity of last resort for the provision of cash for subsistence through to being an opportunistic endeavour for "extra" cash, as well as playing a potentially important social or recreational role. It may also help to counter distributional inequalities within the household.

The study suggests that the fishers involved will attempt to make the most of any economic activity available to them, although there may be a time lag before this becomes statistically apparent. This suggests that development of alternative economic activities may help to reduce the pressure on marine resources by encouraging a greater participation in these activities at the expense of fishing. However, the importance of fishing as a source of nutrition, the high returns relative to costs in terms of the amount of time required to

participate and hence opportunistic possibilities, and the role as a buffer to smooth production and consumption, suggest that few households will move totally out of fishing where it was previously an activity in the household portfolio. If they do, they may do so in the short-run whilst they become accustomed to the availability of new sources of income. This in itself will be an interesting line of further research.

The role of meal-sharing between households and its contribution to nutritional security is an interesting note from this study, and one that should be progressed through further research.

The provision of employment in the present case study appears to have led to a reduction in dependence on marine resources and to a reduction in use of marine resources by the households concerned. Therefore, the thesis that the generation of employment through ecotourism reduces dependence on marine resources is upheld. Whether this will remain in effect permanently may depend on the availability of alternative economic activities to which household resources (e.g. labour and savings) can be directed.

The contribution of employment to development and poverty alleviation of the households under consideration does not appear to be upheld. Indications are that households with members employed have lower levels of consumption than households without members employed. This should be further investigated to establish whether this is the case, and also whether it is a short-run effect that will change as employees invest their money in alternative activities or as remaining household members realise the need to return to their original activities or take up new ones.

The study has shown the potential of using quantitative household surveys to investigate the effect of ecotourism on livelihoods. These methods could be further refined to improve the estimation of household production in particular. Further studies with a much greater number of repeats both at the household level and below should enable the production of useful results that could quantitatively assess the role of economic substitution through employment in conservation. The study should also be repeated in other nearby villages from

where employment is sourced, and where livelihoods are likely to be different due to different institutional, economic and resource variables. This may assist the identification of certain community characteristics that may determine the effectiveness of ecotourism in positively affecting livelihoods for conservation and poverty alleviation.

Finally, continued monitoring over the coming few years while the tourism operation opens to the public will enable the firm acceptance or rejection of the hypothesis that the generation of employment through ecotourism reduces dependence and pressure on marine resources.

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