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Socio-economic Survey of Commercial Fishing in the Okavango Delta, Botswana

By

K. Mosepele and B.N. Ngwenya

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Executive Summary

According to the 2001 population census (CSO, 2002), 98% of the 124,712 people of Ngamiland District in northwestern Botswana live within the Ramsar site boundaries of the Okavango Delta. It has been more than two decades since Skjonsberg and Merefe (1987) completed a socio-economic survey of Okavango Delta fisheries. Conditions in the Delta's hydrology, including human and animal interactive pressures upon it, are changing. Whereas Mosepele (2001) gives a comprehensive description of the structure of the fishery and Mmopelwa *et al* (2005) a case study of economic and financial analysis of commercial fishing, research focusing on the socio-economic dynamics of commercial fishing is lacking. Commercial fishers are one of the major fish resource user groups who harvest the fish resource of the Okavango Delta in Botswana. Knowledge about the role of commercial fishing in meeting the consumption and commercial needs of households in the Okavango is essential to planning for a sustainable fishery development in the Okavango Delta. Such planning must be grounded at the village level in the everyday lives of people who derive their sustenance from fishing. Information about subsistence fishing is important to consider in the development of commercial fishing. To fill this gap, an updated survey of the socio-economic context of commercial fisheries is needed.

This socio-economic survey is part of the BIOKAVANGO Fisheries sector. The overall purpose of this research is to provide current data on the social and economic background of commercial fishing. The specific objectives of the research project are:

- To conduct a desktop survey of available information on the socio-economics of commercial fishery, and assess existing literature on the impact of government financial assistance schemes on the commercialisation of the Okavango Delta fishery;
- To evaluate the viability and accessibility of alternative schemes for development of the fishery;
- To assess the socio-economic status of commercial fisheries;
- To examine commercial fishing households' income levels and labour requirements;
- To analyse of how fishing incomes are utilised;
- To conduct an assessment of whether fishing competes with other sources of livelihoods, and, if so, to determine where fishing ranks as an income source;
- To examine the present and potential role of women and children in commercial fishing in the Okavango Delta fishery, with special reference to production facilities, gear maintenance, fish processing, distribution, marketing, access to credit and direct benefits to children; and
- To survey and analyse fish marketing, distribution, and networks of trade and exchange.

The survey was conducted in 12 villages, namely Samochima, Mohembo West, Seronga, Mogotho, Ngarange, Etsha 13, Sepopa, Etsha 6, Shakawe, Ikoga, Kajaja and Xhaoga. Forty-one (41) commercial fishers, constituting approximately 80% of the total commercial fisher population in the Okavango Delta, were interviewed in these selected villages. Three follow-up focus group discussions were held with commercial fishers in Shakawe, Samochima and Mohembo West in July and August 2007. A community schedule on 'challenges and perceived threats to Okavango fishries' to guide interviews was developed with key informants (chief/headman, fishermen, tourism extension workers, and wildlife and agriculture, land board officers). Key issues discussed included quotas, zoning and a fishing code of conduct. Extensive desktop literature review was undertaken of both published and unpublished sources on the history, structural and temporal variability of Okavango Delta fishery; the value and capital investment of gill net fishery; physical

infrastructure, with particular reference to the Samochima cold storage facility; principal commercial species; fish yield estimations; and age and gender in commercial fishing.

Primary data was used from the Okavango Delta Management Plan (ODMP) Introductory and Second Round kgotla meetings, held in all major villages and remote area settlements in the Okavango Delta Ramsar site. During the Second Round kgotla meetings, over 43 meetings were held, and a total of 3,343 (or 45%) attended the Second Round meetings (Bendsen, 2005).

Key Findings

A. Literature Review Synthesis

- The Tilapia (or bream) species is the main commercially exploited species. Religious and cultural taboos against eating catfish are common.
- During the 1996 and 1997 cattle eradication exercise in Ngamiland (in response to a contagious cattle lung disease), fish revenues contributed substantially to household earnings. Estimated average fish revenues between 1996 and 2002 compare very well with cattle revenues.
- Commercial fishing contribute substantially towards rural development and economic empowerment.
- The Financial Assistance Policy (FAP) facilitated the emergence of a viable and vibrant small scale commercial fishery in the Okavango Delta.
- The commercialisation of the fishery significantly enhanced the socio-economic status of a relatively small number of rural fisher folk in the panhandle area.
- The emergence of a market infrastructure, through LG17 (Local Government development) funds was a significant stage in the development of the fishery.
- FAP marketing projects played a vital role in fish marketing in the Okavango Delta. They filled a gap in fish marketing which had remained open since the government market for dried salted fish ended in the early 1990s.
- The presence of women and children as major players in the fishery possibly attests to the important role that fish plays in rural livelihoods, especially as a major source of protein, and as a seasonal food security strategy, especially in hard times.
- The prominence of traditional fishing gear highlights the integral role played by the fishery as the mainstay of the cultural expression of the rural fisher folk.
- AE10 played an important role in enhancing the group dynamics of the rural fisher folk community, but fell short of enhancing the economic status of the fisher folk.
- Fishing is a component of sustainable development.
- The lack of a national fisheries policy will continue to hamper the comprehensive development of the sector, and hence masks its potential as a major source of rural livelihoods.

B. Household Socio-Economic Survey

- Commercial fishers have the basic literacy and numeracy skills necessary for local trade. The levels of skill however are inadequate, since they do not give them a competitive advantage in the national, regional and international trading arena. These skills are however a trainable resource, whose capacity can the enhanced.

- Commercial fishers' households are predominantly male-headed, whereas basket fisher households tend to be female-headed.

- The mean household size was between 7-10 people, which is higher than the national average of four people, with high proportions of young children.

- With mean household size relatively high, the presence of children might suggest vulnerability to poverty. Male-headed households have access to labour from which to diversify economic activities, as well as to balance production and consumption resource demands.

- The demographic structure of commercial fishers is diverse, dominated by youth below the age of 19 years. However, youth between 11–19 years tend to engage in productive fishing activities (basket or hook and line) and counterbalance the dependent and predominantly consumptive 0-60 month age-group.

- The Commercial fishers' non-income living standards, measured through various characteristics such as access to safe water, safe sanitation, telecommunication and electricity, are comparable to those at national level. Country-wide, a relatively small proportion of individuals has access to housing amenities such as gas, electricity and telephones. A small proportion has reticulated water in their yards, and 30% owned a pit latrine. These assets suggest a certain level of relative affluence.

- Ngamiland West has a higher proportion of commercial fishers than Ngamiland East.

- Compared to subsistence and basket fishers, commercial fishers also have high ownership of some valuable assets.

- Commercial fisher households have a broad range of fishing and non-fishing assets that can be used by different members of the household to pursue a range of income-generating activities.

- The asset profiles of commercial fishers suggest that they are relatively affluent (53% have cattle, 74.4% yoke and plough, 98% fishing nets, 72% aluminum boats, 58% mokoro, in addition to other multi-purpose equipment such as storage drums, donkey carts and wheelbarrows).

- While the majority of commercial fishers own some agricultural assets, only a few perceive them as a major source of income. All commercial fishers perceive fishing as a major source of household income, whereas other sources of income-generating activities are perceived as supplementing this major economic activity.

- The high levels of mokoro (dug-out canoe) ownership attest to the easy accessibility of this asset compared to aluminium or fibreglass boats (i.e. the former are cheaper than the latter).

- Most commercial fishers either used personal funds to purchase the dug-out canoes or they constructed them themselves.

- Not all of them owned fishing nets. It is possible that some commercial fishers use hook and line as their main fishing equipment.

- Aluminium boats have mostly been bought using Financial Assistance Policy funds. These craft are a better means of transport in the shallow, grassy floodplain fisheries during high floods.

- Dug-out canoes limit the amount of fish that can be transported to the landing point because of their limited capacity compared to aluminium boats which are engine-powered and can carry heavier loads.

- There are a limited number of commercial fishers who have enough assets to operate competitively at commercial levels. Few fishers own outboard motors, and few own more than one aluminium boat.

- Although a small percentage of commercial fishers indicated that they own fishing baskets, it is possible that these belong either to the wives or female relatives, who use these for fishing. Fishing baskets catch very small fish (e.g. *Tilapia sparrmani*, *Barbus poechii*, etc.) that have more nutritional (rather than market) value, especially for small children.

- The high ownership of agricultural assets (i.e. cattle, small stock, arable land) by commercial fishers suggests an entrenched primacy of agricultural activities and fish production. Commercial fishing and agricultural production ultimately help families to withstand socio-economic shocks.

- Commercial fishers make more money out of fishing than from either crop or cattle sales.

- The majority (47.6%) of commercial fishers use their personal funds to purchase fishing nets, a large proportion (43.2%) constructed their own mokoro, and government FAP funds were used by the majority of commercial fishers to either purchase aluminum boats or fishing nets. Commercial fishers have limited access to credit (3.7%) through commercial banks.

- The largest proportion of commercial fishers (44.2%) earns between P501-P1,000 per month from fish sales, while the lowest proportion earns a similar salary from temporary jobs (4.8%).

- An equal proportion of commercial fishers (2.3%) earns P4,001 or more per month from both fish and crop sales.

- For the majority (47.6%) of commercial fishermen fishing contributes between 81-100% of their total household income.

- A very small proportion of commercial fishers (7%) felt that selling fish to lodges/tourist camps can turn fishing into a viable income-generating activity.

- The majority of commercial fishers (over 40%) peddle their fish around their villages, 58% transport their fish on foot to selling points, and a small proportion (3%) use refrigerated trailers. The majority (over 80%) also barter fish for grain.

- Cold storage facilities sustain high commercial fisher numbers (due to enhanced market availability). The majority of fishers feel that commercial fish production can be improved through increased peddling in their villages as a marketing strategy.

- A high proportion (60.5%) of commercial fishers' monthly income is used on fuel and fishing gear maintenance expenditure; 23% spend between P401-P550 per month on fuel and fishing gear maintenance. Money spent on fishing gear maintenance and fuel suggests that fishing offers commercial fishers a major source of income and food security and still gives them a chance to re-invest the money into the fishery.

- The majority of commercial fishers (60%) employ fishing assistants during the high fishing season and 36% employ staff on a more permanent basis; 42.9% pay them between P201 and P300 monthly.

- Commercial fishing is a labour-intensive and time consuming activity based on the level of effort involved: 58% of commercial fishers spend 8 hours or more fishing with employees.

- Fishing income gives commercial fishers enough purchasing power to not only buy food, but to also spend money on clothing/footwear and education. A relatively high proportion of households (45%) indicated that fish provides for about half of their household food.

- A majority (78.6%) said the first most important strategy for food supply by commercial fisher households in periods of food shortage is to increase their fish catches.

- Commercial fishers perceive that children in their households are healthier than children from non-fishing households because of dependence on fish as a major source of protein.

- Commercial fishing households are vulnerable to highly debilitating diseases such as AIDS. The majority (60%) of commercial fishers had a chronically ill person in the previous five years prior to the survey, and 36.8% said that serious illnesses had a serious effect on fishing activities.

- It has been established in other parts of the world that women are engaged in end-product fishing, artisanal (or small scale) fishing, commercial fishing, and the preservation, marketing and distribution of fish catches. But the general view is that women fish occasionally, or that it is part of their normal female role to provide fish for home consumption. Fishing for sale is regarded as men's activity, and thus there is no effort to investigate the possibilities of the existence of women who do 'men's fishing' or who fish from 'canoes'. The understanding of 'fishing' as 'commercial or men-only' activity negates the role of women (who are in the majority) in subsistence fishing, and supports a situation of fish exploitation by men.

- Despite women's contribution, there is no quantitative information on the amount of fish provided by women in their households, nor is there any information on the amount of fish sold at the local market. Information on fish harvesting is limited to commercial fishers. To date, women's participation has not received its due official attention (neither in policy or programme intervention).

C. Qualitative Interviews Results

Fishing Methods and the Sustainability of Fish Stocks in the Delta

- In general, fishermen agreed on the need to use the fish resource of the Ramsar site in a sustainable way. However, they stressed that, by applying their traditional fishing methods, the Okavango River waters had never been, nor ever will be, over-fished.

- The variability in fish abundance depends on 'flood pulses' and using appropriate fishing methods that support the sustainable utilisation of fish resources.

- Commercial fishers support the idea of the issuance of fishing permits because this would help monitor off-take accurately. But they are strongly against some fishing regulations, like zoning and closing off fishing seasons, actions that would result in restricting their fishing

operations and ultimately affect (and have adverse effects on) their business because they have few productive fishing grounds.

- In contrast, semi-structured interviews with Fisheries Division Field Officers reveal that they are in favour of zoning some fishing grounds in the Delta in order *'to regulate fishing activities of commercial, recreational and subsistence gillnet fishers but not basket fishers'*. Zoning will help regulate and/or reduce the number of commercial fishers, and with monitoring exact catches per quota.

- Fisheries Division Field Officers also strongly believed that fishing should be regulated and controlled, and mechanisms (e.g. code of conduct to guide fisher group behaviours) need to be put in place to achieve this.

- Like commercial fishers, Fisheries Division Field Officers believe that basket fishing is not good for conservation because basket fishers 'catch small fish using mosquito nets' (the nets also end up catching micro-invertebrates).

- Resource user conflict intensifies during the low flood season. Accusations and counter-accusations are common.

- Commercial fishers and lodge owners are now at an impasse. The issues of dispute have been presented and debated at length with the Department of Fisheries, the Department of Water Affairs, the Okavango Fisherman's Association (OFA), the customary court (kgotla) and other development organisations working with communities in the area.

- From these discussions, it is clear that different resource users view the issue differently. During ODMP consultative meetings, about 6.9% of all the concerns raised by communities were related to fish utilisation access and conservation.

- Villagers had observed long-term alterations in the hydrological regimes of the Okavango Delta, and speculated about possible factors contributing to the reduced water flow, the shifts in the flood distribution pattern, and the blockage and drying up of some parts of the wetland and its outlets. All these changes were perceived posing major threats to the sustainability of their fisheries-based livelihood.

- Few villages identified climate change, that could result in a lack of rainfall in the Angolan highlands, as the key driver of diminishing water levels.

- Fishing activities have been interwoven into the daily lives of fishing communities. Over time, local communities developed emotional as well as utilitarian ties with the aquatic environment. Fishing has shaped their social and cultural values and strong cultural identity. Fishing is also an important social activity that contributes to social cohesion.

- Commercial fishers understand that fish migrate seasonally between flood-season feeding, spawning and rearing habitats. They have site-specific information at a local scale that need to be merged with data from different places of the Delta. Commercial fishers therefore have a comprehensive understanding of hydrology and fish migration and that fish species have evolved life cycles that are intimately adapted to the hydrological cycle of the river. Fishers know this very well and use hydrological indicators to make decisions about their fishing activities.

Policy Recommendations

Commercial fishing is an integral component of the rural livelihood strategy in the Delta. There is therefore a need for sector-specific policies to ensure that this source of rural livelihood and food security is mainstreamed into the general macro-economic development of the Ngamiland region.

1. There is a need to train commercial fishers in basic bookkeeping and financial management to ensure the sustainability of commercial fishing enterprises, which are a major source of economic empowerment and rural employment.

2. Government aid/grant schemes (i.e. FAP, LG17, AE10, etc.) were instrumental in developing commercial fishing enterprises in the Delta. The introduction of CEDA, which has more stringent regulations, may limit access to funding for (potential) commercial fishers, and thus expose the rural fishing community to economic shocks. Perhaps this needs to be tailored for local commercial fishers.

3. Commercial fishing is an extremely labour intensive and time consuming exercise, which is best operated by people in good physical condition. Therefore, HIV/AIDS education needs to be mainstreamed into fisheries extension activities to educate/sensitise commercial fishers about this disease as it may have a negative impact on fishing operations.

4. There is a need to monitor fish marketing activities in the region and to streamline these into general data collection exercises. Furthermore, there is a need to facilitate fish marketing infrastructural development in the Okavango region.

5. The role of women and children (especially boys) in commercial fishing has not yet been clarified, and this needs to be done so that their role in this sector (i.e. commercial fishing) is highlighted. Moreover, issues related to child labour need to be streamlined into commercial fishing enterprises to ensure that the ILO charter is adhered to.

6. There should be a national fisheries policy that will map out the management aims and objectives of commercial fishing in the Delta, as this would then aid general management processes.

7. Management interventions pertaining to commercial fishing need to streamline cultural fishing practices to ensure sustainable fish utilisation.

8. There is a need for government to facilitate the production of a general code of conduct by commercial fishers and other user groups to minimise conflict between these groups.

9. The ecological/traditional knowledge of commercial fishers (and other user groups) needs to be integrated into the fisheries management regime of the Delta to ensure not only compliance by fishers but also sustainable resource utilisation, which is ingrained in most traditional fishing practices.

Chapter 1 - Background

Anon (1989) reported that while the Okavango Delta fishery might have had an insignificant impact on the overall economy (approximately 0.002% of the GDP at market prices) of Botswana, it has local importance in the Northwest/Ngamiland area. Commercial fishing is also a source of employment (Norplan, 1985; Norfico, 1986; Mmopelwa, 2001; Mosepele, 2001a). Approximately 65% of the population in the Okavango Delta area (excluding the villages of Gumare and Nokaneng) depend on fish directly either as part of their diet or income. Norfico (1986) identified three different kinds of fishers in the Delta: occasional, seasonal and professional. Occasional fishermen are casual fishers who fish for subsistence (using simple apparatus from the river banks or by wading into the water) during the hiatus between sowing and harvesting seasons, while seasonal fishers are sedentary people living in floodplains who fish during part of the year. Seasonal fishing is caused by the need to either supplement diet or to generate extra income. This normally results in heightened fishing activity at receding and low water levels. Conversely, professional fishermen fish regularly and at times follow fish stock movements around the Delta using motorised craft. Given the above-mentioned reality, the socio-economic dynamics of the commercial fishery in the Okavango Delta will be investigated in the context of it local importance by different kinds of fishers.

It has been more than 20 years since Skjonsberg and Merefe (1987) completed a socio-economic survey of fisheries in the Okavango Delta. Conditions in the Delta's hydrology have changed dramatically over the years (such as the drying up of Lake Ngami, and the Gomoti and Thaoge Okavango river channels). The observed gradual increase of fishers in the Delta over time (Mosepele, 2001) is most likely due to people's response to a wide range of shocks such as chronic crop failure and the impacts of human and animal diseases (e.g. cattle lung disease and AIDS) (Kgathi *et al*, 2004). An updated household socio-economic survey of specific components of the Delta fisheries is therefore needed. The BIOKAVANGO Project commissioned this study to address that need. The socio-economic survey is part of the Fisheries component of the BIOKAVANGO Project. The overall purpose of this research is to provide current data on the social and economic background of commercial fishing. Knowing about the current value of fisheries to the people of the Okavango is essential to planning for a sustainable fishery. Such planning must be grounded at the village level in the everyday lives of people who now derive subsistence and income from fishing. This village-level perspective is the basis of both our research methodology and this report.

1.1. Objectives and Research Questions

- To conduct a desktop survey of available information on commercial fishery in the existing literature, including assessing the impact of government financial assistance schemes on the commercialisation of the Okavango Delta fishery.

- To evaluate the viability and accessibility of alternative schemes for the development of the fishery.

- To assess the socio-economic status of commercial fisheries.

- To examine commercial fishing households' income levels and labour requirements.

- To analyse how fishing incomes are utilised.

- To conduct an assessment of whether fishing competes with other sources of livelihoods and, if so, to determine where fishing ranks as an income source.

- To examine the present and potential role of women and children in commercial fishing the Okavango Delta fishery with special reference to production facilities, gear maintenance, fish processing, distribution, marketing, access to credit and direct benefits to children.

- To survey and analyse fish marketing, distribution, and networks of trade and exchange.

1.1.1. Research Questions

- What is already known about the socio-economics of the Okavango Delta fishery?
- How do fishing activities affect household living standards?
- How do intra-household relations impact on fishing and vice versa?
- Are fishing incomes invested back into the fishing industry? If not, are they invested elsewhere?
- Are there formal or informal savings?
- Do people opt to fish as a last resort or are the incomes from fishing conducive enough to attract people to embark on fishing rather than other income-generating activities?
- What is the role of women and children in the Okavango Delta fishery?
- What are the formal and informal networks of trade and exchange, especially within and between fishing (and non-fishing) villages?
- What is the state of the current fish marketing system?
- How can the fish marketing system be improved to generate more income for fishermen while maintaining the sustainable utilisation of fish stocks?

1.2. Research Setting

The Okavango River is part of a larger northern drainage system of Botswana which includes the Chobe and Linyati river basins. The annual inflow varies from year to year in response to rainfall levels at the highland regions of Huambo and Kuito in Angola. In general, high levels of rainfall result in high inflow peaks at Mohembo while low rainfall levels result in low inflow peaks. The highest inflow at Mohembo peaks between February and April each year. The Okavango Panhandle begins at Mohembo, where the river enters Botswana. The river is well defined, with flood plains running adjacent to the main river channel (Figure 1.1). The Okavango Delta system provides perennial water sources via its main rivers, inundated floodplains and groundwater, and has a variety of natural resources that support livelihood activities such as farming, fishing, veldt products, grass, reed harvesting and so on for some 80,000 people. The Okavango Delta is also a major international tourist destination, and the world's largest declared Ramsar site. The Delta is located in Ngamiland District in the north-western part of Botswana.

1.3. Research Design and Methodology

Participatory groundwork established liaison with stakeholders. This included discussions with relevant ministries and local and tribal governments, as well as meetings with community leaders, fisheries staff and members of other organisations to elicit their understanding of key questions and gaps in knowledge about the fishing economy, fish consumption and distribution.

Survey questionnaires based on participatory groundwork were developed to elicit information to answer research questions derived from the objectives of this study. Research questions were pre-tested in Ditshiping and Chanoga, then edited and updated. Four project assistants (three second-

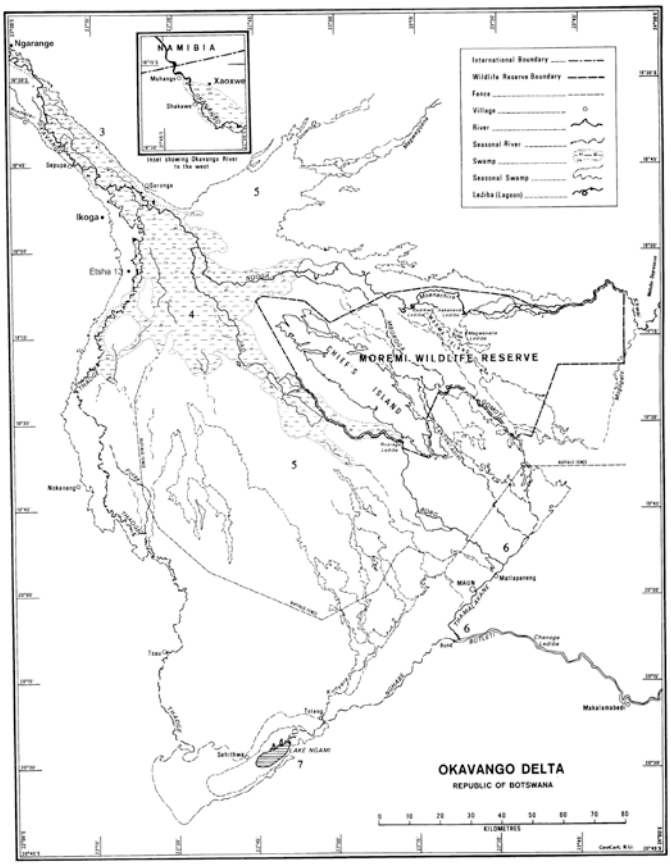

Figure 1.1. The Okavango Delta. The main fishing villages in the upper delta are shown. Shakawe and Xaoxwe are shown in the inset. The numbers indicate the major biomes of the delta. 3: Okavango riverine panhandle floodplain. 4: Permanent swamp. 5: Seasonal swamp. 6: Drainage rivers. 7: Lake Ngami. Source: adapted from Skelton *et al,* 1985.

and third-year University of Botswana students and one 2004 graduate) all from Ngamiland, were employed by the project. Under supervision of project researchers and technicians, these student project assistants conducted interviewes and engaged in other field data collection, as well as in post-field survey data coding, cleaning and entry.

1.3.1. Sampled Villages

This study focuses mainly on households in fishing villages of the Okavango Delta as designated by Mosepele (2000). Flooding patterns over the past 25 years mean that the majority of such villages are in the Okavango panhandle. The survey was conducted in 12 villages, namely Samochima, Mohembo West, Seronga, Mogotho, Ngarange, Etsha 13, Sepopa, Etsha 6, Shakawe, Ikoga, Kajaja and Xhaoga (Figure 1.2). Forty-one (41) commercial fishers, constituting approximately 80% of the total commercial fisher population in the Okavango Delta, were interviewed in these selected villages.

1.3.2. Structured Interviews

Data on commercial fishing was gathered using a survey aimed explicitly at commercial fishers scattered throughout the Delta's fishing villages and camps. Following development of the survey instruments, pre-testing and field staff training, the main surveys took place from 21st June to 3rd July 2004. Data was collected on ethnicity, household income sources and expenditure, social

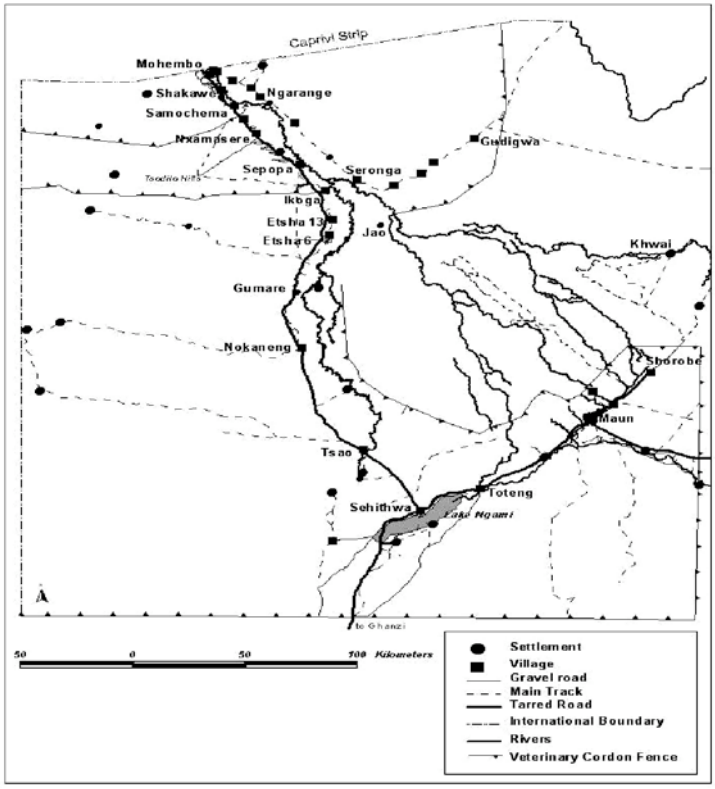

Figure 1.2: Fishing villages around the panhandle. Source: HOORC GIS Lab.

development indicators (housing structure, and access to water, sanitation, health and education), household portfolio of assets (livestock, fishing and non-fishing equipment) and how these were obtained, other income generating activities, fish trade and mode of transport, household expenditure and investment, work and fishing seasons, and fishing and family health. A face-to-face structured questionnaire was administered to 41 commercial fishers.

1.3.3. Group Focus Group Discussion and Informal Interviews with Key Informants

Two follow-up focus groups discussions were held in Samochima with the Boiteko Syndicate on 18/06/2007. Eight commercial fishers participated. Focus group discussions with commercial fishermen from the Mohembo fishing project took place on 17/06/2007 in Mohembo. Six commercial fishers participated in the discussion. A community schedule on 'challenges and perceived threats to Okavango fisheries' was developed to guide interviews with key informants (chief/headman, and fisheries, wildlife, agriculture, land board and tourism extension workers). Key issues discussed included quotas, zoning, and a fishing code of conduct.

1.3.4. Field Reconnaissance Visits and Non-Obtrusive Participant Observation

Data was also collected through informal interviews with commercial fishers during a one week pre-fieldwork reconnaissance visit in Shakawe, Mohembo West, Ngarange and Samochima in March 2007. One of the authors has over ten years' of working experience with commercial fisheries and has spent time with fishermen/women on their fishing trips and in fishing camps, landing sites and market outlets.

1.3.5. First and Second round Okavango Delta Management Plan Consultative Meetings and BIOKAVANGO Consultations

Primary data collected during the second round of the ODMP consultative *kgotla* (traditional court or public assembly) meetings was used in this study (Bendsen, 2005).[1] At the end of 2003 and the beginning of 2004, a round of 33 introductory *kgotla* meetings were held within the revised Ramsar site boundary. The meeting proceedings were documented, analysed and grouped into "hot spot" problem areas, and institutions responsible for addressing the issues were identified. Between the 31st January and the 12th April 2005, 43 *kgotla* meetings were held in all the major villages and remote area settlements in the Okavango Delta Ramsar site. The *kgotla* meetings provided a forum for the exchange of views between resource users and managers, and helped to build consensus on key elements of the planning process and of the approach to ensure the sustainable use of natural resources. *Kgotla* meetings increased from 33 in the first round of consultations to 43 in the second round (Bendsen, 2005). All gazetted villages with more than 500 inhabitants located within the revised Ramsar site boundary were included. Also all settlements that fall under the Remote Area Development (RAD) policy were consulted. Some of the smaller settlements located in the Delta proper, or in the floodplains close to the Buffalo Fence and along the ephemeral river outlets south of the Delta system, were chosen as *kgotla* meeting points. Furthermore, some settlements located far from a major village were consulted separately, as people in theses remote areas would not have been able to attend any of the above *kgotla* meetings.

Seven of the component institutions showed great commitment and were present at all or most of the meetings. These included the Department of Animal Health and Production, the Environmental Health Department of the NWDC, the Tawana Land Board, the Department of Water Affairs, the Department of Wildlife and National Parks and the Department of Fisheries. A total of 3,343 people attended the second round of ODMP *kgotla* meetings. Prior to the *kgotla* meetings, a one week workshop was held for 160 community representatives (community-based organisations, traditional leaders, representatives of resource user groups and NGOs) from throughout the Ramsar site. This took place at Shakawe, and community representatives were informed both about the progress of the ODMP and the intentions of the new Wetland Biodiversity Project.

1.3.6. Stakeholder Workshops

Primary data was also used from the BIOKAVANGO Stakeholder Workshop, which was held with 57 participants (Fisheries Division Field Officers, commercial and subsistence fishers, tour operators, government department officers (Landboard, fisheries, DWNP), CBOs (such as TOCADI), chiefs/headman and Village Development Committee members). The workshop's theme was Working Collaboratively with Fishers towards Minimising Conflicts, and it was held at the Shakawe Sub-land Board offices in Shakawe on 19th-20th February, 2007.

1.3.7. Secondary Data

An extensive desktop literature review was undertaken of both published and unpublished sources on the history, and structural and temporal variability of Okavango Delta fishery, the value and capital investment of gill net fishery, physical infrastructure with particular reference to the Samochima cold storage facility, principal commercial species, fish yield estimations, and age and gender in commercial fishing.

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1. Bendsen, H (2005). The Okavango Delta Management Plan: Second Round of Kgotla Meetings. Harry Oppenheimer Okavango Research Centre Library, Maun.

1.3.9. Data Analysis

Survey data was coded, keyed, cleaned and analysed at the Harry Oppenheimer Okavango Research Centre using SPSS V 12. Qualitative data was thematically analysed.

Chapter 2 - Literature Review

2.1. Variations of Fishers: Structural and Spatial

Various sources give different estimates of the total number of fishers in the Okavango Delta fishery, ranging between 700 and 5,000 fishers from the mid 1970's to the late 1990's (Table 2.1). It is interesting to note that, while the proportion of gill net subsistence fishers appears to have increased over time, that of the commercial fishers has decreased. The gradual increase of subsistence fishers in the Okavango Delta has been attributed to general population increase in the area. Women and children constitute the highest proportion of subsistence fishers (Mosepele, 2001a). In Botswana, women constitute over half of the population (CSO, 1994, 2002a); it is therefore logical that women are likely to be subsistence fishers in the Okavango Delta. Since a higher proportion of households in the area are female-headed, with limited access to a cash income (CSO, 2002; 2004), fishing therefore gives most women and children an opportunity to catch for household consumption and augment their diet. Moreover, with high unemployment, especially in the rural areas, women are less likely to be involved in wage earning jobs (CSO, 2004), and would hence have time for subsistence activities. People in the Okavango Delta generally regard fishing as a social safety net (Mosepele, 2001a; Mmopelwa; 2001, van Hoof, *et al*, 1991, 1993).

Table 2.1. Table illustrating the differences in fisher numbers of the Okavango Delta from various sources.

Data Source	Total Fishers	Subsistence Fishers		Commercial Fishers		Gill-net Fishers
	Numbers	Numbers	Percentage	Numbers	Percentage	Numbers
Anon (1975)	1000					
Norplan (1985)	1200-2000	400	25			
Norfico (1986)				150		
Skjønsberg and Merafe, (1987)	5000					
Anon (1989)[1]	12000	2000	17	695	6	
Silitsena and McLeod (1989)[1]	700	637	91	63	9	
Kolding (1996)						300
Mosepele (2001a)	3200	3159	99	41	1	332

1. These are fishermen estimates for the 1986/87 period.

Fisher groups not only vary numerically (more subsistence and fewer commercial fishes), but also by types of fishing gear used. Women and young girls use fishing baskets (funnel traps constructed from reeds), while men use barrier traps on riverbanks and in floodplains at high and receding water. According to Mosepele (2001a), a hook and line fishing is a used predominantly by young boys, even though some subsistence and professional fishermen use these to supplement their catches. Gill nets are used exclusively by men.

Mosepele (2001a) discusses that, out of the estimated 332 gill net fishers in the Okavango Delta fishery, there is a core of 41 commercial (or professional) fishermen who are generally active year-round. The rest of the fishers are involved in farming activities during other parts of the year (Bills, 1996; Mosepele, 2000, 2001a). Furthermore, traditional fishermen are opportunistic fishers because they are active only during periods/years of good floods. Good flood years lead to fishing

opportunities in lagoons, pools and floodplains peripheral to areas of human settlement. Conversely, poor floods mean that less or no water reaches these *'traditional fishing grounds'*, hence fewer people fish.

There are 589 fishing craft in the Okavango Delta survey area, where dugout canoes (*mekoro*) are the commonest fishing craft in the fishery (63.8%), fibreglass boats the second most common (28.5%) and aluminum the least common (7.7%) (Mosepele, 2001a).

Dugout canoe - mokoro.

Navigable fishing channel.

The preponderance of traditional fishing craft suggests that the greatest percentage of fishers in the Okavango Delta have low financial capital, and as such cannot afford powered fishing craft (Mosepele, 2001a). According to Norfico (1986) and van Hoof *et al*, (1991), traditional fishing crafts (*mekoro*) severely limit fishing excursions and the total distance travelled by fishermen on fishing forays into the Delta. However, fishing from *mekoro* has advantages in low water times, allow the traditional fisher to augment food supplies and assure a steady intake of protein. This

subsequently affects a spatial distribution of fishers in the fishery, and suggests that there is a temporal pulse in fishing activity that revolves around a core of professional fishers in the fishery.

In addition to age, gender and occupation, there is an east/west geographic dimension to the Okavango fishery. According to van Hoof *et al* (1991, 1993), 14% of men in the eastern portion of the Okavango Delta indicated fishing as their secondary activity, while 22% of the men in the western portion indicated fishing as their secondary activity. Similarly, the 1999 C/E data (from Mosepele, 2001a) indicates that 47% of gill net fishermen came from the eastern portion, while 53% came from the western portion. A 1997 frame survey (Mosepele, 2001a) also showed that only 39% of total fishers in the Okavango Delta fishery came from the eastern portion of the panhandle, while the remaining 61% of fishers came from the western and lower portion of the panhandle. While population size (in a given locality) might account for this spatial variation in fisher numbers as shown in Mosepele (2001a), van Hoof *et al* (1991, 1993) attributed the higher fisher numbers in the western portion to market availability.

Physical capital also invariably affects variations in fisher numbers in the Delta (i.e. gill net fishers). Presently, there is one cold storage facility in the Okavango Delta fishery - at Samochima village on the western Okavango. There was a similar facility at Ngarange in eastern Okavango, but this is now non-operational and has been for several years (Mmopelwa, 2000, 2001; Mosepele, 2000, 2001a). Two main factors might account for the Samochima facility's continued existence *vis-à-vis* the broken Ngarange cold storage (Mosepele, 2001a). Firstly, the accessibility of an uninterrupted power supply could have contributed to the longetivity of the Samochima facility. Secondly, its proximity to an all-weather road enhanced its market accessibility, which subsequently contributed to its sound financial position. Furthermore, of the 24 FAP-funded fishing projects in 2000/2001, 19 were in the western Okavango (Mmopelwa, 2001); and of the 31 FAP-funded fishing projects in 2001/2002, 27 were in western Okavango (Mmopelwa, 2002). These observations buttress the argument that the western Okavango appears to have a comparative advantage in fish production, and that this has contributed to higher fishermen numbers in the western rather than the eastern Okavango.

Government grants and a market for dried salted fish facilitated the emergence of a commercial fishery in the Okavango that effectively augmented the hitherto prevailing subsistence fishery (Silitshena and McLeod, 1989; van Hoof *et al*, 1991, 1993). The Financial Assistance Policy (FAP) assisted individual fishermen while the Agricultural Extension Small Projects Programme (AE10) aided fishermen groups or syndicates to finance fishing projects or operations. The Norplan (1985) report shows that the number of fishermen in the Delta in 1984 was approximately 150 FAP subsistence fishermen; 25 commercial fishermen, each with five boys, which amounted to approximately 100 people in total; 70 AE10-funded fishermen; approximately 300 children were involved in the fishery; and fishers using traditional gear (i.e. baskets, weirs, spears, etc.) totalled approximately 500. However, a collage of factors (uncooperative members, declining water levels in some areas, lack of commitment by members, financial mismanagement, etc.) precipitated the collapse of AE10 fishing groups, which could have subsequently contributed to a decline in active fisher numbers in the region (Mmopelwa, 1991, 1992; Norfico, 1986, 1987; Mmopelwa, 1995). Incidentally, the bulk of production from the lower Delta (e.g. Lake Ngami and Mopipi reservoir) came from AE10 fishing groups. Therefore, the disintegration of these groups resulted in a consequent decrease in fishermen numbers in the lower Delta. The drying out of fishing areas, like Lake Ngami and the Boteti river, also resulted in decreased fisher numbers in the lower Delta.

Fishermen in the FAP grant scheme contributed 30% of their total project investment while AE10 group projects contributed only 10%. Successful fishermen then went through a government provided training course on gear technology and post-harvest preservation (Norfico 1986;

Mmopelwa, 1991; Nengu, 1995) Norplan (1985). National Development Bank (NDB) loans were also made available to fishermen, primarily to purchase fishing equipment, and several fishermen received financing through the institution. Government funding not only enhanced the chances of self-employment, but also played a major social binding role because it involved existing social structures in the community. Some marketing problems were identified: 1) transportation problems in taking fresh fish to the market; 2) limited local buying power, and hence the need to transport the product to distant markets; 3) financial problems; and 4) difficulties in raising the required contribution for their grants. These then became new constraints in the commercialisation of the Okavango fishery.

Poor financial management by fishermen was advanced as the main reason for business failure (Mmopelwa, 1989). Bills (1996) validated Mmopelwa's (1989) observation by arguing that commercial fishing is not economically viable in the long term.

The marketing constraints identified by Norplan (1985) were isolation of the fishing areas from major markets in the country, inadequate market infrastructure, low demand for fish among non-fishing people in Botswana and problems associated with fish processing. Norplan (1985) highlighted that some of the perceived benefits from a coherent fish-marketing infrastructure were the creation of employment opportunities, the provision of cheap protein and the direct involvement of more people in the fishery. Current exchange outlets identified by Norplan (1985) were fish consumption by fishermen and their families, local sales of mainly fresh fish and sales to government. Norplan (1985) also revealed that the bulk of fish caught was believed to be consumed directly, because the quantity marketed was just a fraction of the estimated yields from the fishery. Bartering for other foodstuffs, such as grain and meat, which began in the early 1800s, was also identified by the Norplan (1985) report as one of the most important types of exchange in the fishery.

Government provided a market for dried salted fish during the drought period of the 1980s during which the fish were re-distributed throughout the region. Norplan (1985) found that the socio-economic status of local communities was enhanced by commercial fishing during the dried salted fish period, as fishermen could afford clothing for families and pay school fees for their children. According to Silitshena and McLeod (1989), commercial fishermen made approximately P528.00 per fisherman (or approximately $265.00 per fisherman). This observation is confirmed by Mmopelwa *et al* (2005) who observed that commercial fishing in the Delta is a viable economic enterprise that offers positive investment opportunities.

The fate of the fishery has been intimately tied to market success, as illustrated by the collapse of the government market for dried salted fish at the end of the 1980s (Mmopelwa 1990, 1991, 1992; Nengu, 1995). This not only curtailed total production but also caused a general decrease in numbers of FAP-funded fishermen (Mmopelwa 1993; Mosepele 2000, 2001a). After the collapse of the dried salted fish market, and with technical assistance from the Fisheries Section of the ministry of, the fishery switched to a fresh/frozen product in the mid 1990s. Funds procured by the FAP to buy gas refrigerators, nets, boats, engines and camping tents allowed fishers to venture further into the Delta, and to spend extended fishing periods before transporting their product to the market. It was hoped that the existence of the two cold facilities (discussed in the previous section) would alleviate the marketing problem that had consistently plagued the commercial fishery in the Delta (Mmopelwa 1995; Nengu, 1995). However, while these facilities made it possible to introduce two new products in the market (fresh and frozen fish), marketing remains a headache to most fishers (Mmopelwa, 2001, 2002). In fact, van Hoof *et al* (1991) predicted that the provision of cooling facilities would not necessarily improve fish sales. Another major hurdle - transporting the product to market centres - remains. Although this was not well covered by the FAP or other

government funded schemes, the fishery underwent a welcome transition when FAP funded fish marketing projects to alleviate the marketing problem (Mmopelwa, 2002). However, the impacts of these marketing projects on the fishery have not yet been evaluated.

2.2. The Value of Okavango Delta Fishery

Figure 2.1 illustrates an estimate of the total monetary value of the Okavango Delta fishery from 1994 to 2000. Total investments in the fishery increased from just below P100,000 in the 1994-1995 period to approximately P450,000 between 1996 and 1998. Total investments increased exponentially between 1995-1996 and 1996-1997, whereafter they leveled out and then started decreasing. This period of increase in investment corresponds to the outbreak of the cattle-lung disease (CBPP) in the region, as a result of which people resorted to fishing (c.f. Fidzani, 1997). Most of the investment in the fishery during this period resulted from the increased cash flow in the region. This cash flow resulted from either compensation paid to cattle farmers (due to cattle eradication), or from people who were employed in the cattle eradication and restocking programmes and in associated ancillary employment (such as fence erection on the Botswana/Namibia border to control cattle movement between the two countries). Total investment in the fishery is not a true reflection of the actual investment. Investment in this discussion was estimated from the total number of Financial Assistance Policy (FAP) projects approved per year. Therefore, total investment (in real terms) in the fishery might be higher if all people (in addition to FAP recipients) who invested in the fishery were included in the estimate.

Total revenues increased steadily from 1994-1995, and peaked in 1997-1998 at approximately P1.2 Million. There was however a decrease in revenues between 1997-1998 and 1998-1999. Mosepele (2000) attributes this to decreased catches in 1998-1999 arising from decreased effort, since some of the commercial fishers were also cattle farmers and had been granted cattle by government in the restocking programme. These fishers then began to spend most of their time acclimatising their cattle to the area instead of fishing. Revenues increased again between 1998-1999 and 1999-2000, which likely corresponds to the time when most of the fisher-cattle farmers resumed their normal fishing routines after making sure that their cattle had acclimatised (the restocked cattle were bought from other parts of the country and needed a period of adjustment to the new area).

According to Mosepele (2001), total investment between 1994 and 1999 was approximately P1.4 million, while total revenues from the fishery (between 1994 and 2000) were approximately P4.3

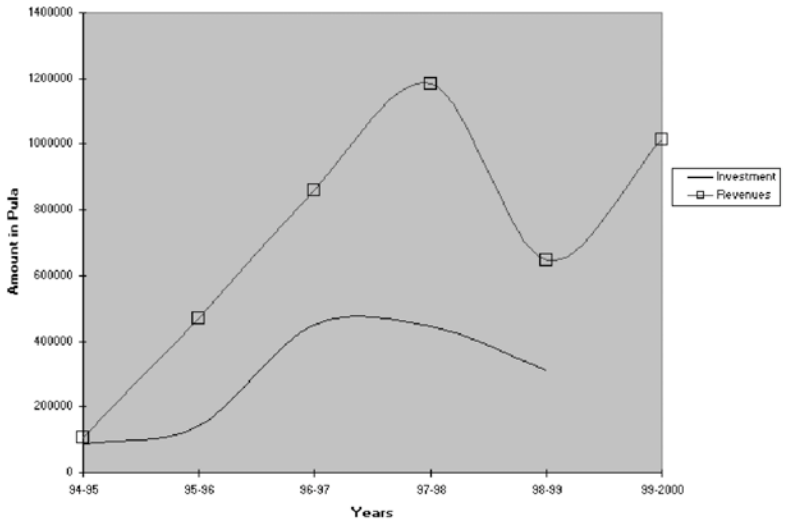

Figure 2.1. Investment and revenue in Okavango Delta Fishery.

million. This translates to an average investment of P290,000.00 per year and an average revenue of approximately P700,000.00 per year. An average fisher in the Okavango would therefore earn approximately P5,000 per year or P660 per month (for 131 fishers). Although this is indeed a generalised and simplistic picture of the actual earnings per fisher, it is interesting to note that this hypothesised average fisher earns just P100 less than the lowest salary in government.

However, the assumption here is that the most efficient fishers in the Okavango Delta fishery own their own cooling facilities (e.g. cool boxes, gas powered refrigerators, etc.) and boats fitted with outboard motors which increase their catching efficiency. This equipment is normally too expensive for an average fisher to buy unless it is purchased through FAP as an initial investment in a commercial operation. Hence, the net contribution of FAP-funded commercial fishers to the total harvest of the Delta is very substantial compared to that of self-funded commercial fishers. It should perhaps be emphasised that approximately 46 outboard motors and 39 aluminum boats were identified in the 1997 frame study. It can therefore be tentatively assumed that in 1997 there were only 39 to 46 commercial fishers in the Okavango, assuming that one commercial fisher owns one aluminum boat and that some fishers might own two outboard motors.

Mosepele (2001) estimated an average of 41 commercial fishers in the Okavango Delta, while 14 were the most active (who on average fish only 7.5 months a year). Using the 1999 catch and effort data, it can be surmised that these 41 commercial fishers contribute 69% of the total catch by weight from the Okavango Delta. This translates to approximately P3 million (between 1994 and 2000) or an average of P500,000 per year (between 1994 and 2000). When distributed per person, this averages to P12,060 per year or P1,600 per month. A slightly different picture emerges if the net benefit and contribution of the 14 most active commercial fishers is considered. The 14 most active commercial fishers contribute 36% of the total catch in weight from the Okavango Delta. This translates to approximately P1.5 million (between 1994 and 2000) or an average of P258,000 per year (between 1994 and 2000). The net benefit per person is P18,000 per year or P2,400 per month (approximately $500). Of course this suggests that the remaining 90 subsistence fishers share only P1.3 million, which averages at P220,000 per year or P2,407 per year per person, which translates to P300.00 per month per person.

According to Mosepele (2001), total capitalisation in the Okavango Delta fishery in 1997 was approximately P1.7 million, and about P200,000 (in variable costs) was plowed back into the fishery that year (or an average of P30,000 per month). Maintenance costs for engines, boats, nets etc. are not included in the variable estimates, so these could actually be a bit higher. For the sake of comparison, it can be surmised that commercial fishers on average make an annual profit of P300,000. Their approximate take-home monthly profit (averaged over a mean period of 7.5 months is then P975.00 (just below $200). This form of rural enterprise is a good example of economic liberalisation, and should be encouraged and supported at all costs by government.

According to Welcomme and Bartley (1998), an ideal fishery should be financially self-supporting. They point out that the financial benefit from the fishery (B) should equal or exceed the costs of producing the catch (C) (or $B \geq C$). Simply put, B refers to the total revenue from a fishery while C might include the costs of harvesting the fish. Based on the preceding discussion, since commercial fishers (41 fishers) make P500,000 per annum as total revenues (or B) and use approximately P200,000 annually in costs (or C), then clearly $B \geq C$, which suggests that the fishery is self-maintaining and profitable. But of course the cost of government services is not included in the equation. It is hoped that this simplistic illustration highlights the economic value of the commercial gill net fishery in the Okavango Delta. This observation is confirmed by Mmopelwa *et al* (2005) who observed that commercial fishing in the Delta is a viable economic enterprise that offers positive investment opportunities.

2.3. Samochima Cold Storage Facility

This facility is regard as a shining example of local entrepreneurial spirit that encapsulates the potential economic value of the Okavango commercial fishery. It was constructed through local government funds (LG17). Total revenues at this facility increased from approximately P100,000 in 1995 to the highest value of about P300,000 in 2000. Average annual revenue from 1997 to 2000 is P225,000 per year (or P141,000 over a 7.5 month period). There are approximately 20 fishers involved in the project, who - on average - make approximately P7,030 per year or P940 per month. Total costs incurred per annum are approximately P6,000 or P800 per month. This translates into a monthly profit of P140 per fisher (Mosepele, 2001a). In 2006, 1 kilgram of fish cost P16 (approximately $3 at the time) (Figure 2.2).

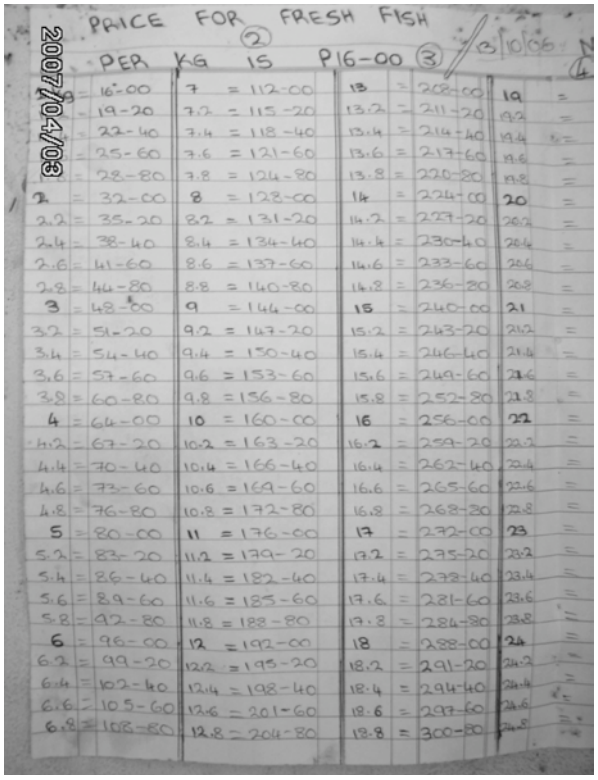

Figure 2.2. Fresh fish price list at Samochima facility - 2007.

According to Mosepele (2001a), the four most active fishermen in this facility contributed 7,192.25 kg in 1999, which is about 58% of the total Samochima catch. This suggests the four most active fishermen make on average P81,000 per 7.5 months, or P20,000 per fisher per annum, which translates to a gross of P2,700 per month and a net of P1,900 after expenses. The most active fisherman at this facility contributes 26% of the total annual catch, which translates to total revenues amounting to P37,000 per annum or P5,000 monthly, or a net of P4,200 per month (Mosepele, 2001a). This example illustrates clearly that B > C, which suggests that the Samochima cold storage facility commercial fishers have an economically viable project. Costs associated with the project levy have not been deducted from the calculations, but these are nominal charges that would not change the resultant values to a high degree. This form of rural enterprise needs to be encouraged because it is a form of sustainable development, which is one of the core principles of the Rio Declaration (Mosepele, 2001a).

2.4. Principal Commercial Species

Recent research has shown that the Okavango Delta's fish stocks are not declining (Bills 1996), and in fact could be underutilised (Mosepele 2000; Mosepele and Kolding, 2002). Mmopelwa (1989) attributed decreases in total annual fisheries production to good rains during the rainy season, which led most potential fishers to focus on arable farming. However, consistent low floods and drought spells caused some productive fishing areas, such as Lake Ngami to dry up, and this had a detrimental impact on the productive viability of the fishery (Mmopelwa, 1989, 1991, 1992; Okacom, 1998).

The main commercially exploited species are Three-spot *Tilapia (Oreochromis andersonii)*, Green-head *Tilapia (O.macrochir)*, Large-mouth Speckle-face *Tilapia (Serranochromis angusticeps)*, Red-breast *Tilapia (Tilapia rendalli)*, Sharp-tooth Catfish *(Clarias gariepinus)*, Blunt-tooth Catfish *(C. ngamensis)* and Tigerfish *(Hydrocynus vittatus)* (Merron and Bruton, 1988; Mosepele 2000, 2001a; Mosepele *et al*, 2003; Mosepele and Kolding, 2003). However, religious and cultural taboos against eating catfish and tiger-fish have resulted in a low demand for the two species (Mosepele, 2000, 2001a). According to Mosepele (2000), most fishers believe that eating catfish causes either ear infections or leprosy. Moreover, eating catfish is strictly forbidden for religious reasons, the paramount reason being that it is associated with a snake because it is scale-less. Most fishers believe that a tigerfish is similar to a dog (because of its sharp canine-like teeth), therefore some people do not eat it. Eating tigerfish is also forbidden for religious reasons (Mosepele, 2000).

Therefore, the Tilapia (or bream) species are the main commercially exploited species in the Okavango Delta, currently valued at approximately $1.50 per kg (Mosepele, 2001a), while the other species (i.e. catfish, tigerfish) are normally either bartered for grain, or sold at approximately $0.60 per kg (van Hoof *et al*, 1993; Mosepele, 2000, 2001a). Therefore, because of their high market value, bream species constitute the largest share of total catch by weight (Figure 2.3) (Mosepele, 2000, 2001a). Tilapia catches appear to have increased between 1996-1997 and 1997-1998, when they reached a threshold around 80-100 tons per annum to the present. Catfish off-take on the other hand appear to have been fluctuating widely since 1998-1999. This pattern could be influenced by either error in catch records or disposal of catfish due to their low market value (Mosepele, 2000). Catches for the other species (tigerfish, silver catfish and other fish) are relatively constant, albeit at very low levels relative to Tilapia or catfish.

Despite its estimated high biomass in the system, silver catfish off-take is very low (Merron and Bruton, 1985, 1988). Merron and Bruton (1985, 1988) observed that species such as silver catfish *(Schilbe intermedius)*, squeakers *(Synodontis spp)* and smaller Cyprinids (e.g. *Brycinus lateralis*)

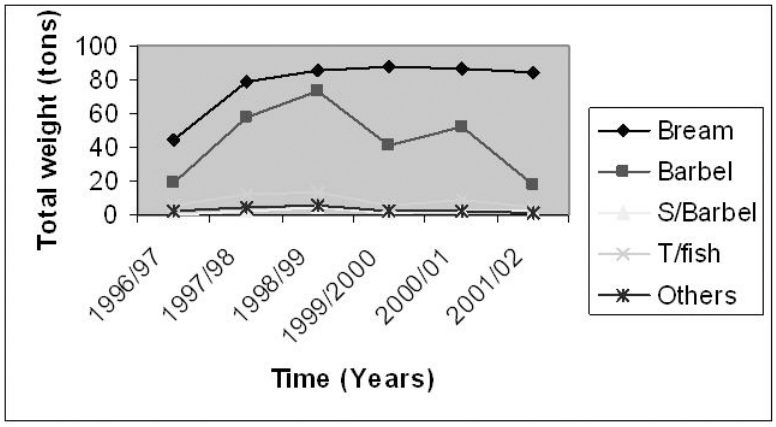

Figure 2.3. Total annual catches by species group from the Okavango Delta gill net fishery from 1996/97 to 2001/02. These annual catches are data collected from the gill net fishery only, and do not therefore include catches from the traditional fishery.

constitute a potentially good-sized biomass, and recommended that they be harvested to relieve pressure on the commercial species. These recommendations have, however, not yet been followed. This choice of species by the commercial fishery is because of targeted fishing that has been perfected by Okavango Delta commercial fishermen (Mosepele 2000, 2001a), who are in this respect similar to the Bangweulu fishermen in Zambia (Kolding *et al*, 1996). Furthermore, the large gill net mesh sizes in the fishery select out smaller-sized species (Merron and Bruton, 1988; Mosepele, 2000, 2001a), which are harvested, albeit at low levels, by the artisanal fishery (Mmopelwa *et al*, 2002).

2.5. Fish Yield Estimations

Several estimates of potential yield have been made for the Okavango Delta over the past three decades (Maar, 1965; Welcomme, 1975, 1979; Fox, 1976; Bruton *et al*, 1984; Norplan, 1985; Norfico, 1986; Merron and Bruton, 1988; Scudder *et al*, 1993; Kolding, 1996). It is worth noting that, with a harvest of 1-2 ton per year, a substantial amount of cheap and yet high valuable protein benefits the Okavango Delta fishers. Moreover, it is also important to highlight the potential financial rewards that might accrue to an enterprising commercial fisher. At current prices, one ton of fish per annum might produce approximately US$6,000 to US$12,000 per fisher in the fishery (assuming a current fish price of approximately US$1 per kg by aggregating both low- and high-valued species). Considering the entire fishery, the potential yield could be as high as US$9 million per annum (again assuming a current fish price of US$1 per kg). This simplified valuation of the fishery suggests that the Okavango Delta fishery has a huge potential to uplift the socio-economic standards of the local fishermen.

Table 2.2 below summarises total annual fish production from the Okavango Delta fishery, with the estimated fisher per capita production. This is rather a simplistic picture of catch per unit of effort in the Delta, where effort is assumed to be an average of estimated total fishers in the fishery between 1975 and 2001. Estimated fisher catch per capita is approximately one tenth (0.1) to one hundredth (0.01) of the potential fisher catch per capita from the fishery. It can be deduced from Table 2.2 that fisher catch per capita production was higher from the 1970s until the mid-1980s, then gradually decreased from the late 1980s until the end of the 1990s. Moreover, Welcomme's (1979) production estimates for the Okavango Delta show that initial production from the fishery in the early 1970s was substantially higher. However, while most of the productive fishing areas, such as Lake Ngami, the Boteti River and the Mopipi Reservoir, still sustained some fisheries, it is doubtful whether production ever reached these levels.

Table 2.2. Total annual yield (estimated and calculated) and estimated per capita fish catch production from the Okavango Delta fishery between 1974 and 1999.

Year	Total Production (tons per year)[6]	Estimated Catch Per Capita Production (tons per year per fisher)
1974[1]	1200	0.306
1976[1]	400	0.102
1985[2]	500	0.128
1987[3]	360	0.092
1988[3]	231	0.059
1989/90[4]	350	0.089
1999[5]	346	0.088

1. Gilmore, 1976. 2. Norplan, 1985. 3. Mmopelwa, 1989. 4. Scudder *et al*, 1993. 5. Mosepele, 2001a. 6. These production figures are estimated for the entire fishery (subsistence (especially fishers using traditional fishing gear like baskets and traps) and commercial).

Table 2.3 summarises the total fish income (and estimated revenue per fisher) that accrued to the Okavango Delta fishery between 1983 and 1991. It is worth noting that while average revenue per fisher was quite low in the 1983-84 period (US$53.00), it had increased quite substantially by the end of the 1980s (US$345). Average cattle revenue per farm in the Okavango region is shown for comparison. Whereas average cattle revenue was approximately four times higher than average fish revenue, fishing was the second most important economic activity after cattle farming in the Okavango Delta in 1993, 1995 and 1996 (CSO, 1995, 1999, 2000). However, this source of income dried up with Lake Ngami's disappearance and the reduced flows of the Boteti River due to environmental changes. Hence, not only was there a reduction in fishermen numbers in the lower Delta, there was also a consequent loss in livelihood options.

Table 2.3. Dried and salted fish sales from the Okavango Delta between 1983 and 1991. Amount in () is US$ estimate for the period assuming that US$1.00 was equivalent to BWP2.00 at current prices.

Year	Amount Allocated/ Used	Estimated Avg. Revenue per Fisher (P)	Average Cattle Revenue per Farm
1983–1984[1]	30,000	106 (53)	941 (471)[3]
1984–1985[1]	74,000	261 (131)	1123 (562)
1985–1986[1]	74,000	261 (131)	1156 (578)
1986–1987[1]	100,000	353 (177)	1944 (972)
1988–1989[2]	146,000	516 (258)	1734 (867)
1989–1990[2]	195,000	689 (345)	
1990–1991[2]	150,000	530 (265)	
Average		388 (194)	1380 (690)

1. Silitshena and McLeod, 1989. 2. Mmopelwa, 1989, 1990, 1991. 3. IUCN, 1992.

Table 2.4 below summarises the estimated value of the Okavango Delta gill net fishery from 1996-1997 to 2001-2002. There were no cattle sales between 1996 and 1997 due to cattle eradication from the area because of a contagious cattle lung disease. During this time, fish revenues contributed substantially to household earnings, assuming that fish constituted an important secondary source of income in the region as discussed above. Average cattle revenue per farm in 1995 was BWP 4,721.00 (approximately US$ 1,180) (CSO, 1999). There were no cattle revenues in 1996 or 1997 (CSO, 2000, 2002a). In 1998, average cattle revenue per farm from local sales rebounded to BWP 5,403.00. Estimated average fish revenues between 1996 and 2002 (Figure 2.4) compare very well with cattle revenues, and this certainly highlights the socio-economic importance of fish in the region.

Mosepele (2001a) further showed that the 41 commercial fishermen in the fishery earned approximately $256.00 per month, while the 90 subsistence fishers earned approximately $50.00 per month (at current prices). Mosepele (2001a) highlights that while only a small percentage of the fishermen might appear to earn relatively good salaries from fish sales, this money is ploughed back into the local economy, thereby contributing substantially towards rural development and economic empowerment. According to Mosepele (2001a), some of the money is invested in purchasing livestock (cattle mostly), operating kiosks (small multi-purpose stores) and brewing traditional beer (for sale).

Perhaps Fidzani's (1997) observation that only few people in the Okavango listed fishing as their main income earner can be viewed from another perspective. Cattle have been and still are a traditional symbol of wealth in Botswana. Some commercial fishers have therefore invested some

Table 2.4. Total annual fish catch production, total annual fish revenues, and estimated annual income per fisher, per annum in the Okavango Delta from 1996/97 to 2001/02. Amount in () is US$ estimate for the period assuming that US$1.00 was equivalent to BWP5.00 at current prices.

Year	Est. Total Annual Fish Production	Est. Total Revenue (BMP)[2]	Est./Total Revenue (US$)	Est. Revenue/ fisher (BWP)[3]	Est. Revenues/ Fisher (US$)
1996/97[1]	71,196.2	622,967	124,593	1,971	394
1997/98[1]	155,065.3	1,356,821	271,364	4,294	859
1998/99[1]	182,054.1	1,592,974	318,595	5,041	1,008
1999/2000[1]	137,863.8	1,206,308	241,262	3,817	763
2000/01[1]	151,984.4	1,329,864	265,973	4,208	842
2001/02[1]	111,069.23	971,856	194,371	3,075	615
Sum	809,233.03	7,080,790	1,416,158	22,406	4,481
Average	134,872.17	1,180,131.67	236,026.33	3,734.33	746.83

1. Data from Mosepele, 2001a. 2. Fish prices from Mosepele, 2001a. 3. Average income is estimated by assuming that there are approximately 316-gill net fishers in the delta (i.e. average between Kolding, 1996 and Mosepele, 2001a estimates as shown in Table 2.3).

of their fish earnings into cattle (personal communication) and other livestock. Moreover, most of the fishers (commercial and subsistence) barter some of their catch (catfish, tigerfish, silver catfish and other species) for grain, firewood, etc. An ordinary fisher would not regard these as economic exchanges and would therefore not consider fish to be a major source of income. Moreover, until recently, fish marketing used to be a major problem in the Okavango, and fishers were therefore not operating at their maximum capacity. Fishers would therefore not necessarily regard fish as their main source of income in view of the market situation. Fish marketing infrastructure has only developed recently (around 1999 according to Mosepele (2001a)).

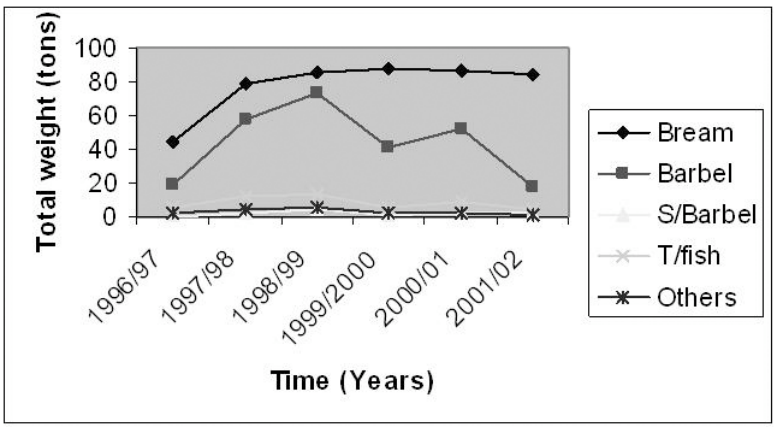

Figure 2.4. Fish Revenues between 1996 and 2002.

2.6. Gender, Age, Ethnicity and Intermittency in Commercial Fishing

Of the total number of fishers identified by Mosepele (2001a), 44 % (1,431) were women, while men accounted for 56% (1,812) of the fishing population (Table 2.5). Some big villages such as Gumare, Nokaneng and Maun were not included in the frame survey, based on the assumption that there were no fishers since floods had not reached those areas in several years. However, the 1999/2000 floods reached some of these areas, and people started to fish again (personal obser-

vation). The number of people who directly depend on the Okavango fishery is thus likely much higher than estimated. Most commercial fishers do not regard their children or spouses as employees. Field observations, however, indicate that a wife and children in some families assist the father full-time and would therefore qualify as employees. The highest proportion of fishers (36.7%) is aged 11-20 years (average 16 years) while there are very few fishers aged more than 80 years in the fishery (0.2%). Women and children assist in smoking and drying fish, especially in the fishing camps. Moreover, the actual number of people involved in the Okavango fishery is possibly much higher than the estimated number. Based on participant field observations, most basket fishers indicated that the extent and intensity of the flood regime regulates their fishing behaviour. Therefore, they have a higher propensity *not* to fish during low flood levels, especially if the floodplains adjacent to their villages do not received water. The fishers would then indicate they are not fishers, just because they missed fishing for one or two seasons, but would start fishing the moment the floods reached their villages. Discontinuous fishing behaviours are thus also likely to be imbedded in commercial fisher households.

Table 2.5. Total number of fishers in the Okavango Delta by category from two data sources.

Fisher Category	Data Source	
	Mosepele (2001a)	Anon (1989)
Basket Fishers	1,431	3,000
Hook & Line Fishers	1,490	6,000
Subsistence Fishers	200	2,000
Commercial Fishers	41	695

Five ethnic groups are involved in fishing in the Okavango Delta. According to Table 2.6, the Bambukushu are the most numerous in the fishery while the Barotsi are the least involved. Merron (1989) also observed that the Bayei and Bambukushu are the dominant peoples in the artisanal fishery, and Skjonsberg and Merafe (1987) made a similar observation. Most of the fishers have 10 or less years fishing experience (44.2%) compared to only 2.9% of the fishers who have been fishing for between 71 and 80 years (Mosepele, 2001a).

Table 2.6. Ethnicity and fishing in the Okavango Delta.

Tribe	Total Number	Percentage
Bayei	748	23.1
Bambukushu	2,231	68.8
Basarwa	160	4.9
Bakgalagadi	83	2.6
Barotsi	21	0.6
Sum	3,243	100

2.7. Summary and Preliminary Conclusions from Literature Review

- FAP facilitated the emergence of a viable and vibrant small-scale commercial fishery in the Okavango Delta.
- The commercialisation of the fishery significantly enhanced the socio-economic status of a relatively small number of rural fisher folk in the panhandle.
- The emergence of a market infrastructure, through LG17 funds, was a significant stage in the development of the fishery.

Women smoke and dry fish.

Fishing camps inside the Delta.

- FAP marketing projects played a vital role in fish marketing in the Okavango Delta. They filled a gap in fish marketing which had remained since the government market for dried salted fish ended in the early 1990s.
- AE10 played an important role in enhancing group dynamics of the rural fisher folk community, but fell short of enhancing the economic status of the fisher folk.
- The lack of a national fisheries policy will continue to hamper a comprehensive development of the sector and hence mask its potential as a major source of rural livelihoods.
- Fishing is a component of sustainable development.

Chapter 3 - Survey Results

3.1. Household Demographics and Standard of Living

As expected, all the 41 commercial fishers interviewed were male. Commercial fishers have basic literacy and numeracy skills that have been acquired either through non-formal or formal education. As summarised in Table 3.1, the majority of commercial fishers (35.7%) have had non-formal education, while a relatively large proportion (21.4%) has had either lower primary or no education at all. A small proportion of commercial fishers have had secondary education (Table 3.1).

Table 3.1. Level of education of commercial fishers from the study villages.

Level of education	Proportion
Non-formal	35.7
Lower primary (standard 1 - 3)	21.4
Never	21.4
Upper primary (standard 4 - 7)	16.7
Form 2/3	2.4
Form 5	2.4

Sixty-nine per cent of commercial fishers in the study villages indicated that they were married while only 31% indicated that they were single (Figure 3.1).

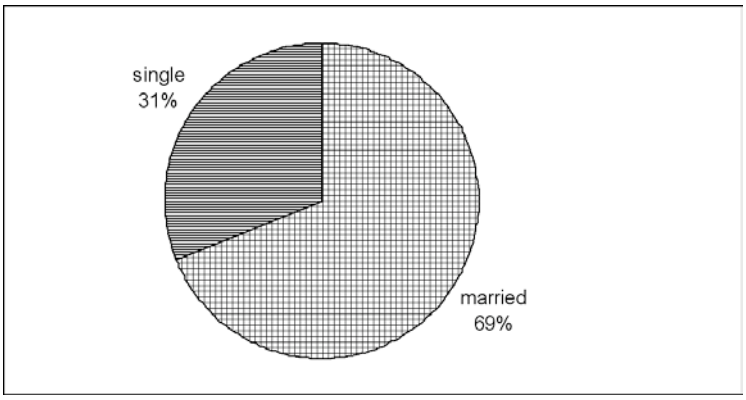

Figure 3.1. Marital status of commercial fishers.

As summarised in Table 3.2 Samochima and Mohembo West had the highest proportion of commercial fishers (20.9%) of all the villages surveyed. The lowest proportion of commercial fishers (2.3%) was found in Ikoga, Kajaja and Xhaoga villages. Overall, Ngamiland West had the highest proportion of commercial fishers (72.1%).

The Hambukushu are the main ethnic group (37%) involved in commercial fishing in the study villages, followed by the Bayei and the Basarwa. Other ethnic groups made up the remaining 21% of the respondents interviewed (Figure 3.2).

Table 3.2. Relative proportions of commercial fishers by village.

Village	Proportion (%)	Village	Proportion (%)
Samochima	20.9	Sepopa	7.0
Mohembo West	20.9	Etsha 6	4.7
Seronga	9.3	Shakawe	4.7
Mogotho	9.3	Ikoga	2.3
Ngarange	9.3	Kajaja	2.3
Etsha 13	7.0	Xhaoga	2.3

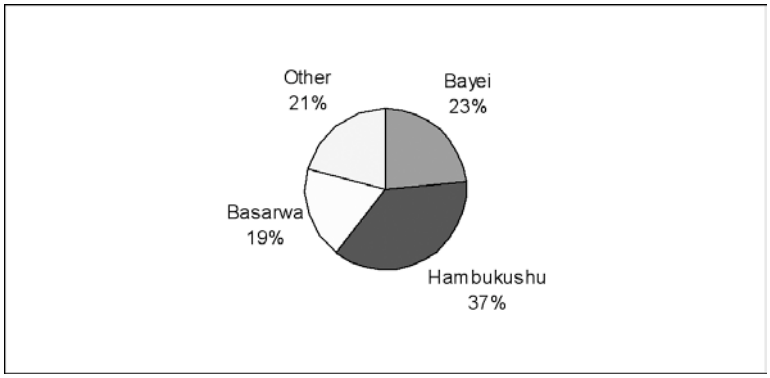

Figure 3.2. Proportion of the different ethnic groups involved in commercial fishing in the study villages.

Table 3.3 summarises the age group distribution in commercial fisher households. The highest proportion identified in the households was the age group 11-19 years (55.8%). A significant proportion (48.8%) of commercial fishers households have at least one child 5 years old or younger.

Table 3.3. Proportion of the age distribution of people in commercial fisher households in the study villages.

Age Group	Frequency	Proportion (%)	Age Group	Frequency	Proportion (%)
0-60 months	1-2	48.8	11-19 years	1-2	55.8
	3-5	18.6		3-5	18.6
	6-8	2.3	20-54 years	1-2	41.9
61 months-10 years	1-2	48.8		3-5	37.2
	3-5	16.3		6-8	4.7
	6-8	4.7		9 or more	2.3
	9 or more	2.3	55 and older	1-2	37.2
				3-5	4.7

The majority of commercial fisher households' size in the study villages was 7-10 people (44%), while few households had 11 people or more (Figure 3.3).

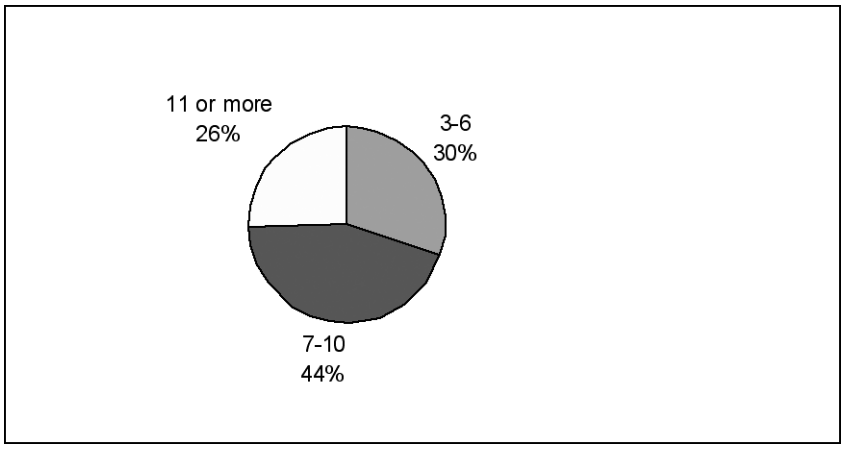

Figure 3.3. Commercial fishers' household size in the study villages.

3.1.1. Household, Water, Sanitation and Energy

As summarised in Figure 3.4, the majority of commercial fisher households (approximately 80%) get their water from communal stand pipes. Few commercial fishers in the study villages have either reticulated water in the yard or own self-dug wells.

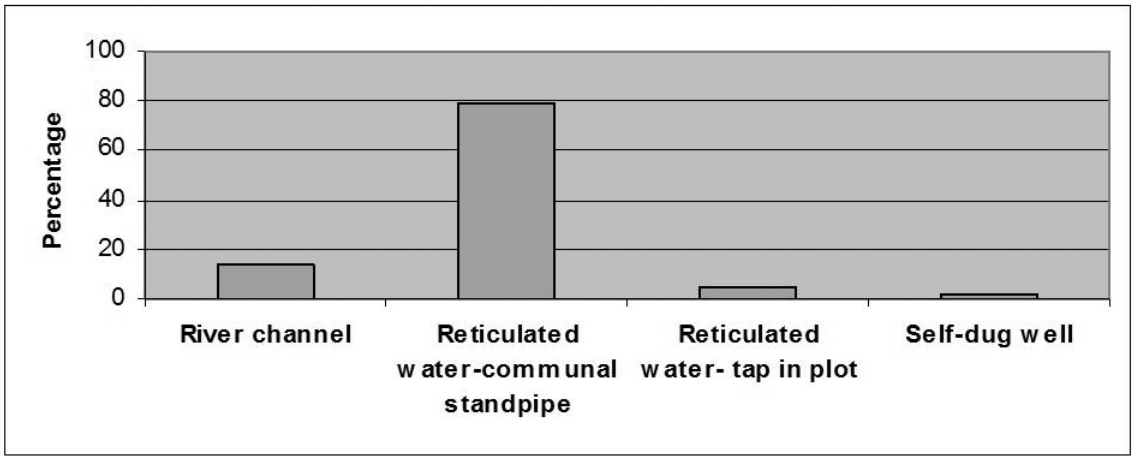

Figure 3.4. Means of water supply to commercial fisher households in the study villages.

The majority (66%) of commercial fishers do not have toilets at home and relieve themselves in the bush as illustrated in Figure 3.5. However, a good proportion (30%) of commercial fisher households has pit latrines, while very few either have ventilated latrines or flush toilets in their households.

The majority (95.3%) of commercial fishers use wood as their major source of cooking fuel, as summarised in Table 3.4. Moreover, most commercial fishers use paraffin or gas lamps as lighting fuel, while a small proportion (9.3%) use electricity. Country-wide, a relatively small proportion of individuals has access to housing amenities such as gas, electricity and telephones.

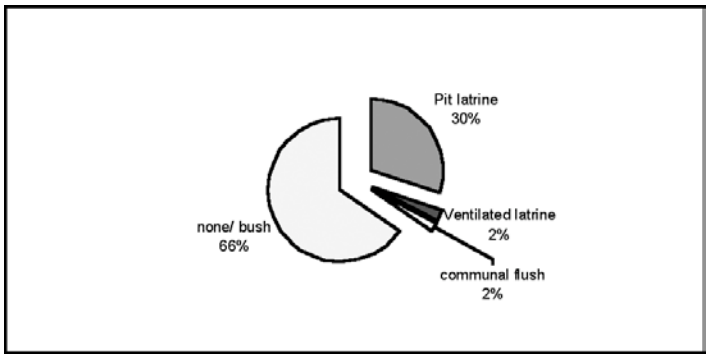

Figure 3.5. Toilet facilities available to commercial fisher households in the study villages.

Table 3.4. Different fuel types (cooking and lighting) available to commercial fisher households.

Fuel Type	Proportion (%)	Fuel Type	Proportion (%)
Cooking fuel		*Lighting fuel*	
Wood	95.3	Candles	37.2
Gas	4.7	Paraffin/ gas lamps	44.2
		Electricity	9.3

3.2. Household Assets

Arable fields for crop production is the commonest asset (over 80%) owned by commercial fishers in the study villages, followed by small stock, while cattle are the least common asset owned by commercial fishers (Figure 3.6).

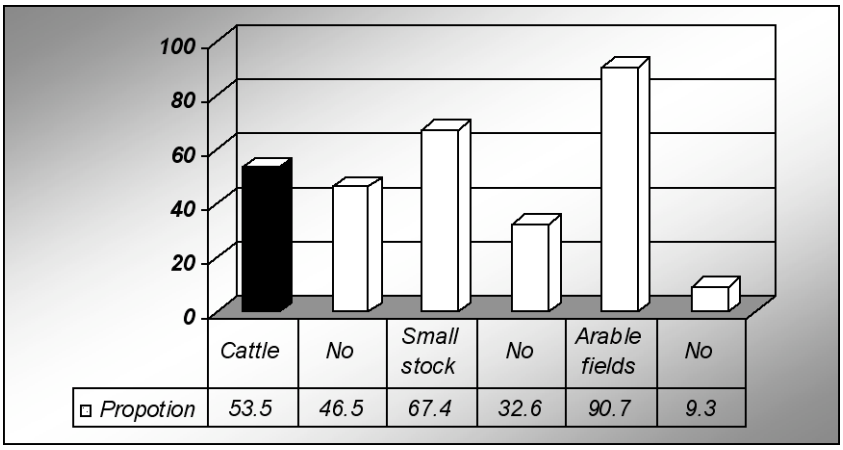

Figure 3.6 Proportion of agricultural assets owned by commercial fishers in the study villages.

Multi-purpose equipment, such as storage drums, donkey carts and wheel barrows, is important (especially in the context of chronic water shortage, and the ability to engage in various seasonal economic activities). The majority of commercial fishers (86%) had a 25 or 50 liter water drum, followed by yoke and plough (74.4%) and donkey cart (41.9%). No commercial fishers owned any tractor or water pump, while a small proportion own either a borehole (4.7%), pickup (4.7%) or standpipe in the yard (4.7%) as summarised in Table 3.5.

Table 3.5. Assets owned by commercial fishers in the study villages.

Asset	Yes (%)	No (%)
25/ 50 liter drums	86	14
Yoke and plough	74.4	25.6
Donkey cart	41.9	58.1
Wheelbarrow	25.6	74.4
Gun	23.3	76.7
Generator	11.6	88.4
Borehole	4.7	95.3
Pickup	4.7	95.3
Standpipe in yard	4.7	95.3
Tractor	0	100
Water pump	0	100

3.2.1. Fishing Assets

The majority of commercial fishers (97.7%) own fishing nets and aluminum boats (72.1%), while no commercial fishers own wooden boats as summarised in Table 3.6. A small proportion of commercial fishers indicated that they own fishing baskets (4.7%).

Table 3.6. Fishing assets owned by commercial fishers in the study villages.

Fishing asset	Yes (%)	No (%)
Fishing nets	97.7	2.3
Aluminum boats	72.1	27.9
Mokoro	58.1	41.9
Other fishing assets	37.2	62.8
Fiberglass boat	18.6	81.4
Outboard motors	16.3	83.7
Fishing baskets	4.7	95.3
Wooden boats	0	100

Table 3.7. summarises the frequency of ownership of different fishing assets by commercial fishers in the study villages. The majority of commercial fishers own at least one mokoro (52.6%), while a relatively large proportion also owns at least one aluminum boat (47.5%), and less than half of the respondents own at least one fiberglass boat (29%). Moreover, a small proportion of commercial fishers owns at least one outboard motor (17.2%), while a good proportion of fishers owns between two to five fishing nets (50%). Few fishers indicated that they own one fishing net (9.5%). The majority of fishers indicated that they don't own fishing baskets (96.3%), except for a small proportion who indicated that they own at least two to five fishing baskets (3.7%), while another small proportion indicated that they owned at least one fishing spear (17.2%).

3.2.2. Basket Fishing

Whereas commercial fishing is also undertaken off-shore in main river channels, there is evidence of basket fishing in commercial fisher households (3.7%) which is likely to occur in the flood plains and lagoons, particularly in summer.

Table 3.7. Frequency of ownership of different fishing assets by commercial fishers in the study villages.

Fishing Asset	Frequency	Proportion (%)
Mokoro	None	36.8
	1	52.6
	2-5	10.5
Aluminum boats	None	25
	1	47.5
	2-5	27.5
Fiberglass boat	None	71
	1	29
Outboard motors	None	75.9
	1	17.2
	2-5	6.9
Fishing nets	1	9.5
	2-5	50
	6-9	21.4
	10-20	16.7
	31 and above	2.4
Fishing baskets	None	96.3
	2-5	3.7
Fishing spear	None	72.4
	1	17.2
	2-5	10.3
Other assets	None	56.7
	1	33.3
	2-5	10

Women and children basket fishing in floodplains.

Fishing basket.

3.2.3. Investment in Fishing Assets

The majority of commercial fishers use their personal funds to purchase fishing nets (47.6%), while only a small proportion used their personal funds to purchase aluminum boats (5.1%). A few commercial fishers mostly used cattle sales to purchase mokoro (5.4%), while a large proportion of commercial fishers constructed their own mokoro (43.2%). Government's FAP was used by the majority of commercial fishers to either purchase aluminum boats (51.3%) or to buy fishing nets (47.6%). Bank loans were used by a small proportion (3.7%) of commercial fishers to purchase fiberglass boats (Table 3.8.).

Table 3.8. Summary of different sources of funding for fishing assets by commercial fishers in the study villages showing relative proportions (in %).

Funding method	Mokoro	Aluminum boat	Fiber glass boat	Outboard motor	Fishing nets	Fishing Spear
Personal funds	16.2	5.1	18.5		47.6	16.7
Cattle sales	5.4	2.6			2.4	
Self constructed	43.2					20
Gift	2.7	5.1			2.4	
FAP[a]		51.3	11.1	25.9	47.6	
AE-10[b]		12.8				
Bank Loan			3.7			
N/A	32.4		66.7	74.1		63.3

NB: a = Financial Assistance Policy; b = Agricultural Extension Small Projects Programme.

3.3. Household Income

Fishing is the major source of income generation to all the commercial fishers interviewed in the study villages, while a small proportion of them are employed in the formal sector (23.3%), have temporary jobs (18.6%), or are employed in thatching houses (14%). A small proportion of commercial fishers (2.3%) indicated that one of their economic activities is craft or basket sales (Table 3.9.).

Table 3.9. Commercial fishers other income-generating activities.

Employment opportunity	Yes (%)	No (%)
Fishing	100	0
Formal sector	23.3	76.7
Temporary jobs	18.6	81.4
Thatching	14	86
Crop sales	11.6	88.4
Social welfare benefits	9.3	90.7
Livestock sales	7	93
Street vendor	7	93
Other	7	93
Shebeen	4.7	95.3
Carpentry	4.7	95.3
Craft/ Basket sales	2.3	97.7

A small proportion of commercial fishers earn less than P500 per month from fishing activities (27.9%), while the smallest proportion earn less than P500 per month from cattle sales (2.3%). The largest proportion of commercial fishers (44.2%) earns between P501–P1,000 per month from fish sales, while the lowest proportion earns a similar salary from temporary jobs (4.8%). Further-more, 14% earns between P1,001–P2,000 per month from fish sales, 4.7% earns P3,001–P4,000 per month from fish sales, while the lowest proportion earns a similar amount from livestock sales (2.3%). An equal proportion of commercial fishers (2.3%) earns P4,001 or more per month from both fish and crop sales in the study villages (Table 3.10).

Table 3.10. Summary of monthly earnings from the different employment opportunities by commercial fishers in the study villages showing relative proportions (in %).

Monthly earnings	Formal sector	Temporary jobs	Fishing	Crop sales	Livestock sales
Less than P500	5.1	9.5	27.9	11.6	2.3
P501 - P1000	5.1	4.8	44.2		
P1001- P2000	5.1	2.4	14		
P2001- P3000	2.6	2.4	7		
P3001- P4000			4.7		2.3
P4001 and more			2.3	2.3	
None	82.1	81		86	95.3

The majority of commercial fishermen in the study villages (47.6%) estimated that fishing contributes between 81–100% of their total income. Only a small proportion of fishers (4.8%) indicated that fishing contributes less than 20% of their income, as summarised in Table 3.11. The majority of commercial fishermen (79.1%) indicated that fishing is a primary activity and produces enough income to displace other income-generating activities, such as farming, livestock rearing and small businesses (Table 3.12.). The majority of commercial fishers (44.2%) feel that fishing can be made a viable income-generating activity through peddling in the village. A very small proportion of commercial fishers (7%) felt that selling fish to lodges and tourist camps can turn fishing into a viable income-generating activity (Table 3.13.).

Table 3.11. Estimated proportion of income from commercial fishing.

Estimate	Proportion (%)
Less than 20%	4.8
20 - 40 %	9.5
41 – 60%	14.3
61 – 80%	23.8
81 – 100%	47.6

Table 3.12. Commercial fishers' opinion on whether fishing is their primary activity.

Opinion	Proportion
Yes	79.1
No	20.9

Table 3.13. Commercial fishers perception on how fishing can become a viable income activity.

Activity	Yes	No
Peddling in village	44.2	55.8
Ownership of fish stall	37.2	62.8
Membership to Cold Storage Facility	18.6	81.4
Selling to lodges/ tourist camps	7	93

The majority of commercial fishers (over 40%) peddle their fish around their villages, while only a small proportion (less than 10%) sells their fish to the private sector (lodges and tourist camps) as illustrated in Figure 3.7.

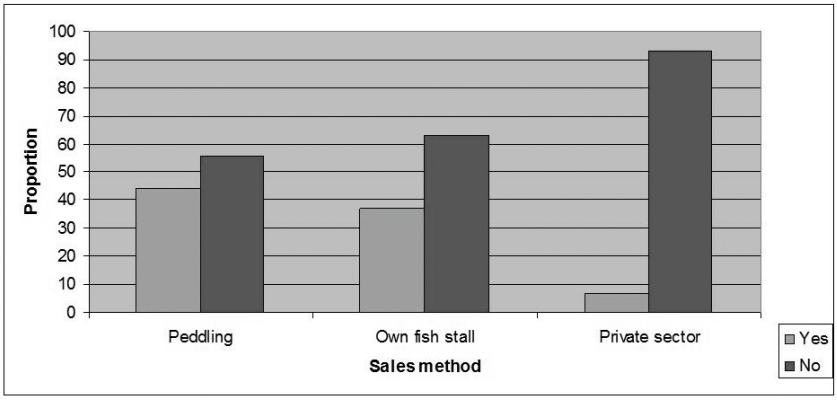

Figure 3.7. Different fish selling/marketing methods used by commercial fishers in the study villages.

Most commercial fishers (58%) transport their fish by foot to their selling points while only a small proportion used refrigerated trailers (3%), as shown in Figure 3.8.

Over 80% of commercial fishers in the study villages indicated that they barter their fish for other products, and the majority of them (over 80%) indicated that they barter fish for grain. A small proportion also indicated that they barter their fish produce for shop goods such as sugar and oil, (Figure 3.9.).

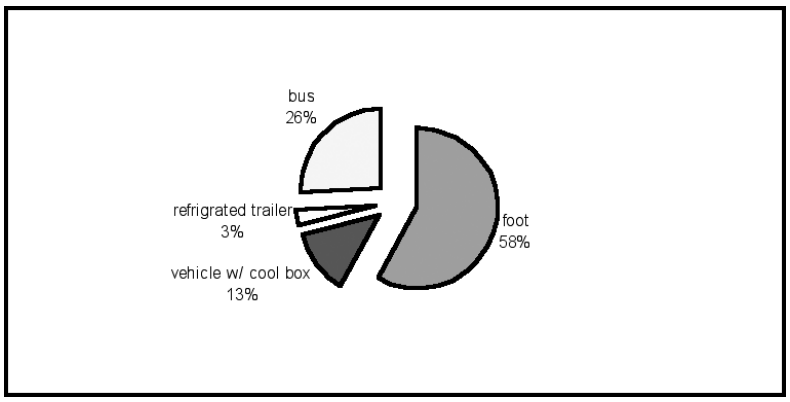

Figure 3.8. Different methods used by commercial fishers to transport their product to the market.

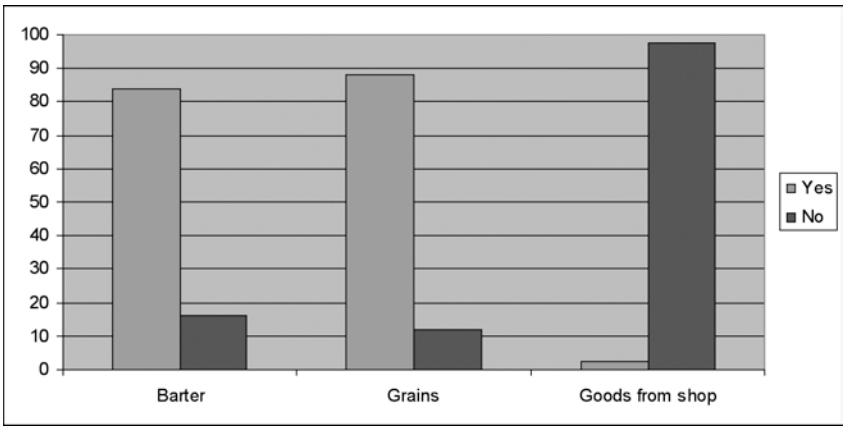

Figure 3.9. Barter opportunities and different items bartered for fish by commercial fishers in the study villages.

3.4. Household Expenditure

A high proportion of commercial fishers (74.4%) indicated that food is their main monthly expense, followed closely by fuel and fishing gear maintenance (60.5%), with transport as the third main monthly expense (58.1%). A small proportion of commercial fishers (20.9) indicated that they also spend money on alcohol and tobacco (Table 3.14.).

Table 3.14. Summary of monthly expenditure by commercial fishers in the study villages.

Monthly expenditure	Yes (%)	No (%)
Food	74.4	25.6
Fuel and upkeep of fishing gear	60.5	39.5
Transport	58.1	41.9
Education	48.8	51.2
Other household	41.9	58.1
Clothing/ footwear	34.9	65.1
Alcohol/ tobacco	20.9	79.1

The majority of commercial fishers (47.2%) spend P100 or less per month on transport, while a small proportion spends the same amount on alcohol and tobacco. A relatively high proportion of commercial fishers (28.6%) spend between P101–250 per month on education, while a small proportion spends the same amount on other household expenses (2.9%). Furthermore, another slightly higher proportion of commercial fishers (21.4%) spend between P251–P400 per month on food while the smallest proportion of fishers spends a similar amount on other household expenses. A relatively large proportion of commercial fishers spend between P401–P550 per month on fuel and fishing gear maintenance, while the smallest proportion of fishers spends a similar amount on other household expenses. The highest proportion of commercial fishers (22.9%) spend P551 and more per month on fuel and fishing gear maintenance, while a small proportion (2.9%) spend a similar amount on alcohol and tobacco (Table 3.15) in a typical month.

Table 3.15. Summary of monthly expenses on different items by commercial fishers in the study villages showing relative proportions in % on a typical month.

Monthly expenses (BWP)	Food	Alcohol/ tobacco	Other household goods	Clothing/ footwear	Transport	Education	Fuel and fishing fishing gear maintenance
100 or less	16.7	8.6	37.1	6.7	47.2	22.9	22.9
101 – 250	28.6		2.9	13.3	16.7	25.7	11.4
251 – 400	21.4		2.9	16.7	5.6	5.7	5.7
401 – 550	4.8		2.9	3.3			11.4
551 and more	9.5	2.9	8.6	6.7	5.6	5.7	22.9
None	19.0	88.6	45.7	53.3	25.0	40.0	25.7

3.5. Household Investment

The majority of commercial fishers in the study villages indicated that they invested some of their fish income from the previous year (Figure 3.10). Figure 3.11 shows that a high proportion of commercial fishers (30%) uses their fishing income to purchase fishing nets, while only a small proportion (2%) uses fishing income plus a loan or grant to purchase their fishing nets. A high proportion of commercial fishers (41.9%) indicated that they invested part of their fishing income on gill nets, while only a small proportion (9.3%) invested part of their fishing income on fishing hooks (see Table 3.16). The majority of commercial fishers expressed their desire to make future investments of less than P5,000 in the fishery, as summarised in Table 3.17.

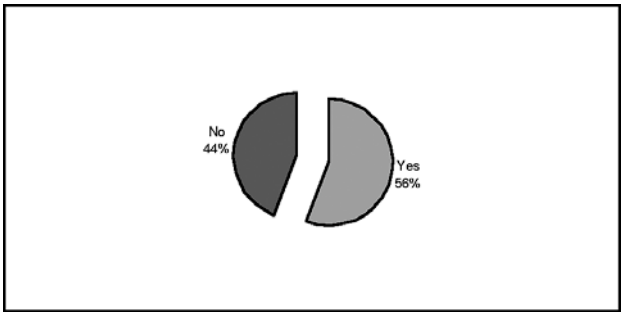

Figure 3.10. Proportion of commercial fishers who invested some of the previous year's fishing income.

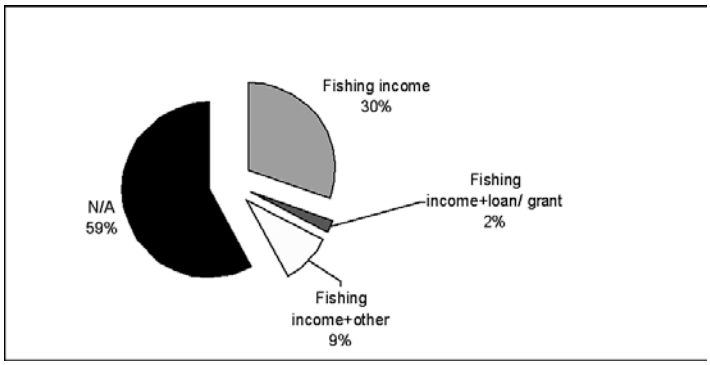

Figure 3.11. Different sources of income used by commercial fishers in the study villages to purchase fishing nets.

Table 3.16. Summary of investments made by commercial fishers on fishing assets in the study villages.

Fishing asset	Yes	No
Gill nets	41.9	58.1
Hooks	9.3	90.7

Table 3.17. Summary of different future investments that commercial fishers in the study villages would like to make.

Investment level	1	2	3
Less than P5,000	68.4	74.2	70.4
P5,001- P10,000	21.1	9.7	3.7
P10,001- P15,000	5.3	9.7	14.8
P15,001 - P20,000	5.3		3.7
P20,001 or more		6.5	7.4

3.6. Fishing Labour and Seasonality

According to Figure 3.12, the hot and dry season is the best fishing season (62%) while the rainy season is the worst fishing season (2%). As illustrated in Figure 3.13, the majority of commercial fishers (60%) indicated that they employ fishing assistants during the high fishing season.

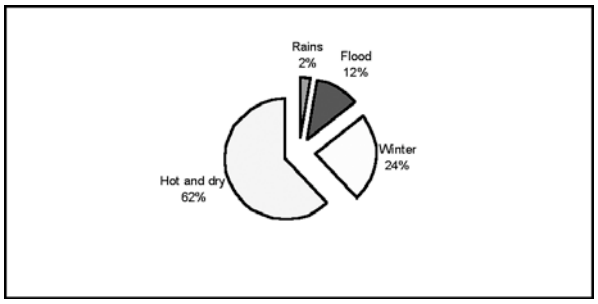

Figure 3.12. The main, or most important, fishing season identified by commercial fishers in the study villages.

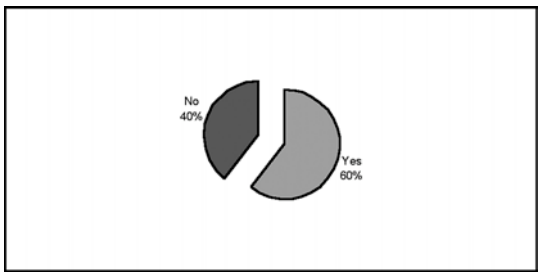

Figure 3.13. Illustration of employment during the high fishing season by commercial fishers in the study villages.

As summarised in Table 3.18, the majority of commercial fishers (60%) pay their seasonal employees P10.00 per day during the high fishing season, while only a small proportion (20%) pays them P20.00 or P30.00 per day. Moreover, for the commercial fishers who pay their seasonal employees monthly, the majority (42.9%) pay them between P201 and P300 per month. Only a small proportion of fishers (4.8%) pay their seasonal employees P100 or less, or P401 or more.

According to Figure 3.14, a slightly lower proportion of commercial fishers (36%) employs staff on a more permanent basis, while the majority does not.

Table 3.18. Summary of payment options on a daily and monthly basis to seasonal employees by commercial fishers in the study villages.

Payment options	Daily	Monthly	
P10.00	60	P100 or less	4.8
P20.00	20	P101 - P200	19.0
P30.00	20	P201 - P300	42.9
		P301 - P400	28.6
		P401 or more	4.8

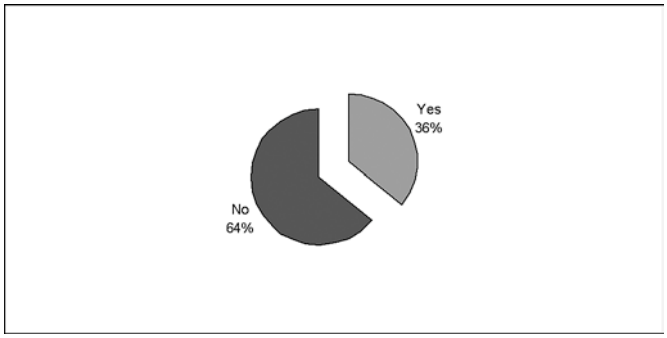

Figure 3.14. Proportion of commercial fishers in the study villages who employ staff on a more permanent basis.

The majority of commercial fishers (50%) employs only one employee, while a small proportion (just above 20%) has three employees (see Figure 3.15).

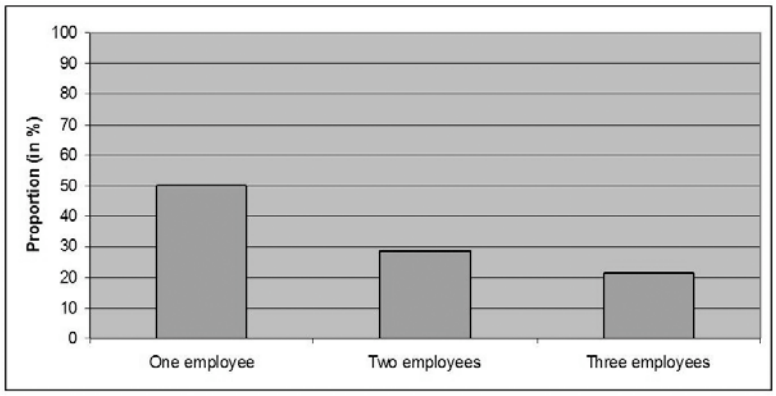

Figure 3.15. Frequency of employees per commercial fisher in the study villages.

The majority of commercial fishers (just over 50%) are active daily (including weekends), while only a small proportion of fishers (less than 10%) fish only one day per week (Figure 3.16).

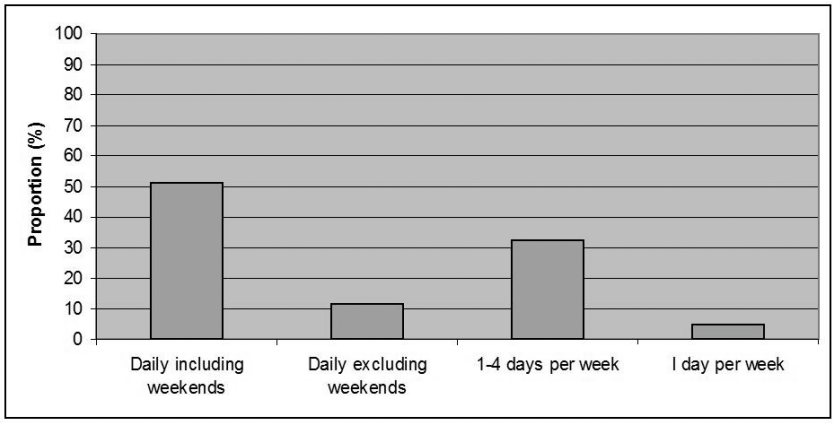

Figure 3.16. Frequency of fishing by commercial fishers in the study villages.

Approximately 60% of commercial fishers fish with employees in the study villages, while just below 20% fish with male relatives and or friends (Figure 3.17.).

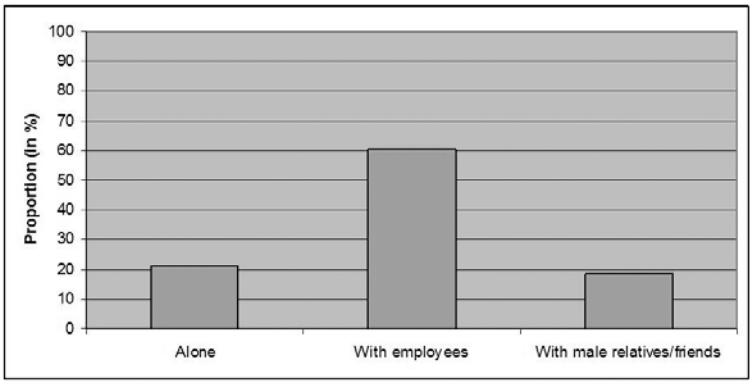

Figure 3.17. Commercial fishers' companionship during fishing activities.

The majority of commercial fishers (58%) spends 8 hours or more fishing while a small proportion spends 4-6 hours (Figure 3.18).

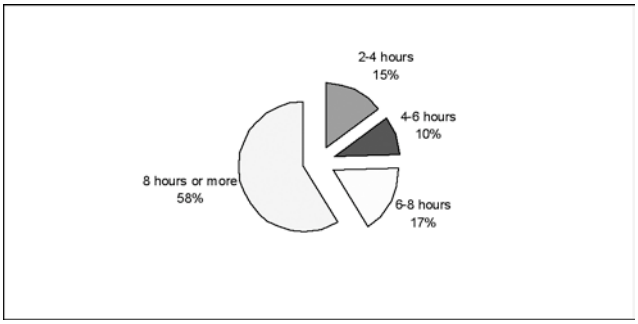

Figure 3.18. Proportion of time spent fishing by commercial fishers in the study villages.

3.7. Food Security

As summarised in Table 3.19, over half (55%) of the commercial fisher households produces and consumes their own food. Furthermore, a relatively high proportion of households (45%) indicated that fish provides for about half of their household food.

Table 3.19. Summary of proportion of food produced and consumed by the commercial fisher households and a summary of the household food provided by fish products.

	Proportion (%)
Proportion consumed	
Less than half (<50%)	35
More than half but not all	55
All (100%)	10
Proportion provided	
Very small amount (less than 10%)	25
About half	45
More than half	30

As illustrated in Figure 3.19, over 30% of commercial fisher households occasionally can purchase or barter food, while around 10% almost never are able to purchase or barter food.

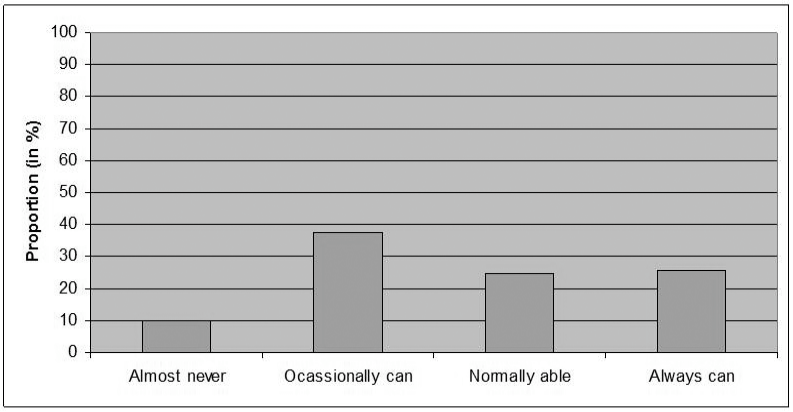

Figure 3.19. Illustration of commercial fisher households' capacity to purchase or barter food in the study villages.

As summarised in Table 3.20, the first most important strategy for food supply by commercial fisher households in periods of food shortage is to increase their fish catch; the second major strategy is to cut down on meals, while the third major strategy is to either cut down meals or borrow cash.

The majority of commercial fishers perceives fish as the major food provision strategy during periods of food shortage, while 19% perceives fish as an important strategy (Figure 3.20).

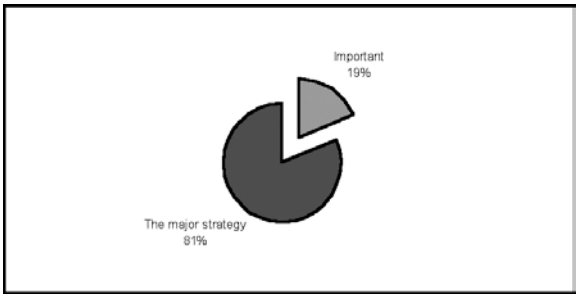

Figure 3.20. Importance of fish during periods of food shortage in commercial fish households in the study villages.

Table 3.20. Summary of three most important ways in which commercial fisher households supply themselves with food during periods of food shortage.

Strategy	1	2	3
Cut down meals		16.7	21.6
Reduce portions	4.8	2.4	10.8
Look for paid work	4.8	11.9	2.7
Gather wild fruit		9.5	2.7
Borrow food from relatives		4.8	8.1
Borrow cash	2.4	7.1	21.6
Receive food rations		2.4	2.7
Exchange food			5.4
Increase food catch	78.6	9.5	5.4
Other	9.5	23.8	8.1
None		2.4	10.8

3.8. Fishing and Health

As illustrated in Figure 3.21, the majority of commercial fishers perceives children from their households to be healthier than children from non-fishing households. A majority of commercial fishers indicated that they had had a terminally ill person in their household five years prior to the survey (Figure 3.22). While a majority of commercial fishers (50%) perceives that serious illnesses do not have any effect on fishing (activities or consumption), a relatively large percentage of fishers (36.8%) feel that serious illnesses have a serious effect on fishing (activities or consumption) (see Table 3.21).

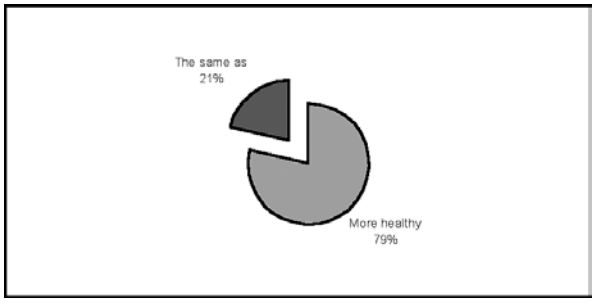

Figure 3.21. Summary of commercial fisher perceptions on the health status of children (10 years and younger) in their household.

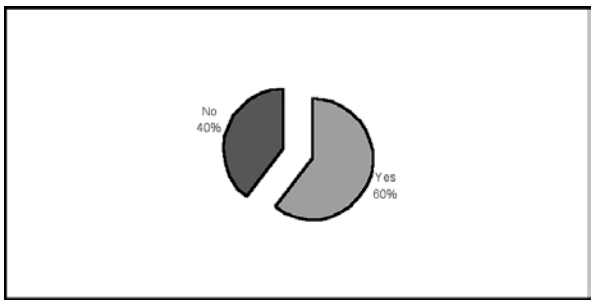

Figure 3.22. The presence of terminally ill people in commercial fisher's households in the study villages in the previous 5 years prior to the survey.

Table 3.21. Summary of commercial fisher's perceptions on the effect of terminal illness.

Effect	Proportion (%)
Seriously	36.8
Moderately	7.9
Minimally	5.3
Not at all	50.0

The majority of commercial fishers (83%) feels that AIDS is a major concern in the fishing community, as illustrated in Figure 3.23.

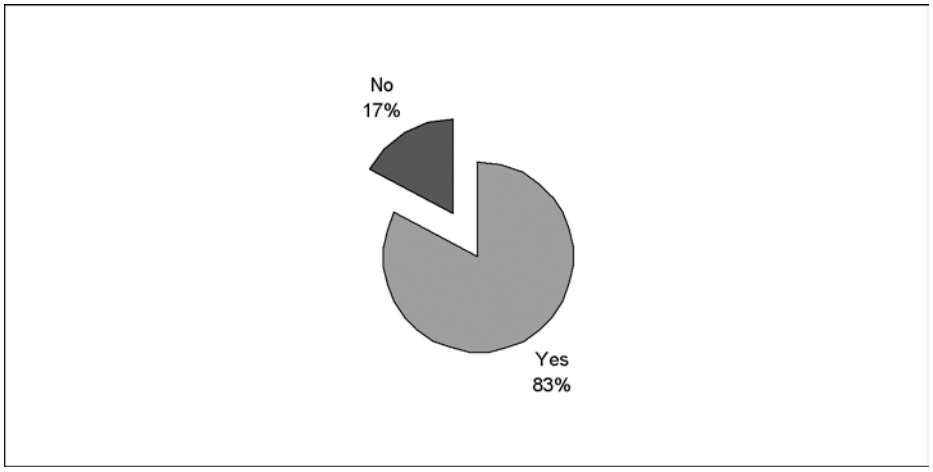

Figure 3.23. Commercial fisher perceptions on whether AIDS is a concern to the fishing community in the study villages.

Chapter 4: Discussion

4.1. Demographics

This survey showed that Ngamiland West has a higher proportion of commercial fishers than Ngamiland East, which agrees with van der Haiden (1991) who made a similar observation. This spatial separation in commercial numbers could be related to the presence of developed infrastructure (e.g. all-weather roads, marketing infrastructure, etc.) in Ngamiland West, which has been discussed before by Mosepele (2003). The presence of high commercial fisher numbers in Samochima and Mohembo West is attributed to the presence of cold storage facilities in these two villages. It is assumed that these are not only fish landing points, but also provide a centralised market point where customers come to buy fish regularly.

All the commercial fishers who were interviewed in the Delta were older men, which is consistent with Mosepele (2001), who highlighted that commercial fishing is a male-dominated vocation in the Okavango Delta. The Hambukushu is the main ethnic group within the commercial fishing sector in the Delta, with the Bayei a distant second, followed by the Basarwa and various other ethnic groups. This is hardly surprising, taking into account that, while Basarwa were the first fishing group in the Delta according to Tlou (1985), fishing was commercialised by the Bayei while the Hambukushu are the most numerous ethnic group in the area and have a long fishing tradition.

The mean household size was between 7-10 people with high proportions of children, which is higher than the national average of 4 people (CSO, 2006). Interestingly, the level of literacy among commercial fishers is generally high, as most have either undergone non-formal education or have been formally educated at primary school level. Despite these apparent high literacy levels, these results agree with the low levels of education that Camargo and Petrere (2000) observed in the Amazon's commercial fishers. While mean household size is relatively high, and the presence of children might suggest vulnerability to poverty, the presence of a literate male-headed household could also suggest that commercial fisher households are potentially shielded from socio-economic shocks, unlike subsistence fisher households.

Commercial fishers are generally more affluent in terms of their access to water and energy (although less on the basis of sanitation). While the majority of fishers indicated that they collect water from communal stand pipes, which are accessible to everybody in the community, it is worth noting that a small proportion has reticulated water in their yards, which suggests a certain level of affluence. Moreover, while a high proportion of fishers indicated that they relieve themselves in the bush, a relatively large proportion (30%) of respondents indicated that they owned a pit latrine, which again is a symbol of some level of affluence. Furthermore, only a small proportion of fishers (7.1%) indicated that they had no means of lighting fuel, while the majority either used candles, paraffin, gas or electricity, which is certainly a sign of affluence in the community.

4.2. Assets

The following two sections address the assets owned by commercial fishers as revealed by this survey. The first section looks at general household assets, while the second section focuses on fishing assets. These sections also highlight the significance of asset ownership and their implications to the socio-economic status of the fishers.

4.2.1. Household

The relatively high ownership of agricultural assets (i.e. cattle, small stock and arable land) by commercial fishers suggests a strong agricultural background and suggests that these assets are possibly used to complement fish production. This certainly suggests that commercial fishers are actively involved in two major vocations - commercial fishing and agricultural production - which ultimately helps them to withstand socio-economic shocks if either vocation is adversely affected. According to Mosepele (2000), fishing is seen as a social safety net that most fishers turn to when general socio-economic conditions are bad. However, this survey has shown that it is possible that commercial fishers engage in these twin vocations to cushion themselves against shocks from either vocation. It is possible that, if arable or pastoral farming fails, then fishers can always resort to commercial fishing to sustain them, and vice versa.

Commercial fishers also have high ownership of some valuable assets, which suggests that they are relatively affluent, compared at least to subsistence fishers who, according to Mosepele *et al* (2007), are among the most marginalised communities in the Delta's periphery. High ownership of a yoke and plough is again indicative of the strong agricultural base of some of the commercial fishers, while ownership of a donkey cart indicates mobility. This agrees very well with Tlou (1985), who observed that the Hambukushu are predominantly arable farmers and these are the dominant commercial fisher groups. The high ownership of 25 and/or 50 litre drums suggests the ability of commercial fishers to have storage facilities, although it is possible that these drums are also used to keep fuel for their outboard motors. Notwithstanding the above, it is possible that some commercial fishers use these drums to store water, especially as the majority of them collect water from communal stand pipes.

4.2.2. Fishing

While the survey revealed that commercial fishers have a wide array of fishing assets, it is interesting to note that not all of them owned fishing nets. While this was not on the list of fishing assets, it is possible that some commercial fishers use hook and line as their main fishing equipment. Indeed, in the hands of an experienced fisherman, hook and line is a much more efficient and selective fishing gear than gill nets, as shown in Mosepele *et al* (2003). Also interesting were two commercial fishers who indicated that they own fishing baskets. This contradicts with Mosepele (2001), who indicated that basket fishing is exclusively undertaken by women and girls in the Delta. It is therefore possible that these two respondents have either wives or female relatives who own and use these fishing baskets instead of the men. This observation is made on the basis that fishing baskets catch very small fish (e.g. *Tilapia sparrmani, Barbus poechii,* etc.) (Mosepele *et al*, 2003), which have more nutritional (rather than market) value, especially for small children. Furthermore, the one respondent who indicated that he owned one gill net could not possibly operate at a commercial level with such limited equipment. This is based on the observation that gill nets regularly get torn by hippos and crocodiles (Tlou, 1972), and generally larger numbers of nets are needed to operate at commercial levels (Cerdeira *et al*, 2000). It is therefore possible that either this person was mistakenly identified as a commercial fisherman, or he also uses other fishing gear like hook and line to supplement his gill net catches.

The high levels of *mokoro* (dug-out canoe) ownership attests to the easy accessibility of this asset compared to aluminium or fibreglass boats (i.e. the former are cheaper than the latter). This is evident when the survey shows that most commercial fishermen either used personal funds to purchase the dug-out canoes or they constructed them themselves. This is different from the procurement of aluminium boats, where Financial Assistance Policy funds were used to purchase them. Particularly important, however, is the observation that dug-out canoes are a better means of transport in the shallow, grassy floodplain fishery during high floods, according to Mosepele *et al*

(2007). Moreover, these crafts are used by some commercial fishers in fishing reconnaissance as part of their fishing activities, as discussed in Mosepele *et al* (2007). This therefore suggests that, apart from being relatively cheap compared to aluminium boats, dug-out canoes are an intrinsic part of commercial fishing in the Delta.

It is worth noting, however, that dug-out canoes limit the amount of fish that can be transported to the landing point when compared to aluminium boats, which are engine-powered and can carry heavier loads. Moreover, dug-out canoes limit the total distance travelled by commercial fishermen in their fishing forays in the Delta. This suggests that only a few commercial fishers have the ability and capacity to travel further and carry heavier fish loads than the majority. One important observation made here is that government financial assistance schemes were instrumental in procuring some of the most expensive fishing assets in the Delta's commercial fishing community. Irrespective of this, however, there is only a relatively small number of commercial fishers who have enough assets to operate competitively at commercial levels. This assertion is based on the observation that few fishers own outboard motors, few own more than one aluminium boat, and few own six gill nets or more. Notwithstanding all of these factors, a good proportion of commercial fishers use personal funds to procure fishing assets such as gill nets, which is indicative of relatively strong purchasing power. There is also evidence of investment of agricultural production into the fishing sector, where some commercial fishers use money from cattle sales to purchase fishing nets, aluminium boats and dug-out canoes. A similar observation was made by Almeida *et al* (2001) in the lower Amazon, where commercial fishers used money from cattle sales to invest in the fishery.

4.3. Household Income

While the majority of commercial fishers own some agricultural assets, it is worth noting that only a few of them perceive these as a major source of income. All commercial fishers perceive fishing as their major source of household income, where the other income-generating activities are possibly used to supplement this major economic activity. This observation agrees with Cerdeira *et al* (2000), who observed that commercial fishing (even at a small scale, such as that present in the Delta) in the lower Amazon is an important economic activity and a major source of income. Moreover, it is worth noting that commercial fishers on average make more money from fishing than from all their other economic activities in the Delta. Again it makes for an interesting observation that commercial fishers make more money out of fishing than from either crop or cattle sales. This observation agrees very well with Mosepele (2003), who observed that commercial fish production compared very well with cattle revenue in the region. Again this contradicts Fidzani *et al*'s (1999) observation that fishing is not among the top ten most important economic activities in the region. Moreover, not only do the majority of commercial fishers feel that fishing is a primary economic activity compared to other economic pursuits, but several reports (CSO, 1995, 1999, 2000) stated that fishing was the second most important economic activity in the region after cattle production in 1993, 1995 and 1996.

While it is obvious from this survey that villages with cold storage facilities sustain high commercial fisher numbers (due to enhanced market availability), the majority of fishers feel that commercial fish production can be improved through increased peddling in their villages as a marketing strategy. The perceived benefits of belonging to a group such as the Samochima Cold Storage Facility could be deterred by the service levy that is charged on members. Therefore, fishers could feel that this might erode their profit margin and may have a tendency to shy away from any potential development that has cost implications. This perception is best observed in the high proportion of commercial fishers who transport their fish to the market on foot compared to those who use motorised transport (see Figure 3.10).

Not only is fishing a major source of income to commercial fishers, it also allows them access to grain through bartering, which helps to diversify their food base. Moreover, it is possible that those fishers who barter their fish for grain in turn sell the grain for monetary gain. This observation is based on the fact that, being a predominantly agrarian people, the Hambukushu generally spend a part of their income on agricultural pursuits (as seen through the high ownership of yoke and plough), and would have access to grain. Therefore, this grain bartered from fish could end up as a surplus, which would then be sold. (The lead author, K. Mosepele, has a personal experience with one commercial fisherman with the Samochima Cold Storage Facility, who told him that he does this regularly.) Essentially, the value of the commercial fishery might be insignificant at a national scale, but it certainly is relatively valuable at the regional and local scale. This mirrors Almeida *et al*'s (2001) assertion that the value of the lower Amazon's commercial fishery is more significant at the local scale than at the national level.

4.4. Household Expenditure and Investment

Fishing income gives commercial fishers enough purchasing power to not only buy food, but also to spend money on clothing, footwear and education. This agrees very well with Norfico (1987), who discussed that commercial fishing during the dried salted fish era gave fishers enough income to spend money on their families. Money spent on fishing gear maintenance (and fuel) suggests that fishing offers commercial fishers a major source of income and food security while still giving them a chance to re-invest money into the fishery. While it has been postulated before that FAP-funded commercial fishing projects are not sustainable and would likely collapse at the end of the funding period due to poor financial management (Bills, 1996), available evidence from this survey suggests the contrary. There is a strong indication that commercial fishers are actively and deliberately re-investing money back into the fishery to ensure sustainable business enterprises. This observation is further buttressed by data which shows that fishers spend a substantial portion of their fish income in purchasing gill nets and hooks. Purchasing hooks validates an earlier observation made that some commercial fishers supplement their fish catches with hook and line (Mosepele *et al*, 2003).

Commercial fishers also showed a strong desire to make investments into fishing to make the enterprise more economically viable. However, from the survey it is evident that the fishers are financially conservative, because the majority of them indicated that they would want to make investments worth P5,000.00 or less. Again this highlights an observation made before, that fishermen are generally financially conservative (Mosepele, 2001). This conservativeness could arise from being accultured to a capricious business environment in which fish availability is subject to sharp fluctuations and can change at any time. Making large investments in this high-risk business enterprise might not be advisable, because of high fluctuations in fish availability, both inter- and intra-annualy. This observation is based on Mosepele (2000), who observed that fish availability in the Delta is subject to high spatio-temporal variations.

4.5. Fishing Labour and Seasonality

The majority of commercial fishermen indicated that the hot and dry season is the best period for fishing while the rainy season is the worst. The hot and dry season in the Delta corresponds to low water levels in the Delta according to Ramberg and van der Waal (1997). This observation agrees with what Welcomme (1985) calls the concentration effect, wherein fish catches increase due to fish confinement in restricted areas arising from low water levels. Mosepele (2000) made a similar observation that this period (hot and dry season) corresponds to low water levels in the Delta, in which fish become concentrated and thus easier to catch. Similarly, the rainy season corresponds to the ploughing season, when the majority of commercial fishers leave the gill net for the plough

(Mosepele, 2001). Notwithstanding the above, the rainy season overlaps into the flooding period in the Delta, when, according to Mosepele (2000), there is a dilution effect on fish stocks that reduces fish catch size. These observations agree with Amargo and Petrere (2000), who observed that the hot and dry season is the best fishing season in the Amazon's commercial fishery. Furthermore, Cerdeira *et al* (2000) also observed that the best fishing season in the lower Amazon occurs during the dry season for migratory fish species, while fishing during the rainy season generally results in poor yields.

Seasonal employment is one of the major characteristics of commercial fishing in the Delta, especially during the high fishing season. Some commercial fishers also employ fishing assistants on a more permanent basis. This observation agrees with Mosepele (2001), who also discussed that commercial fishing is a source of rural employment in the fishing villages. Camargo and Petrere (2000) also highlighted that commercial fishing is a source of rural employment in the Amazon. A similar observation, made by Almeida *et al* (2001), was that the fishery of the lower Amazon is a major source of regional and local employment.

Based on the survey, it is evident that commercial fishing is a labour-intensive and time-consuming activity. Mosepele (2000) observed that commercial fishermen are active daily at more than eight hours a day during the fishing season. This observation agrees with Kolding *et al* (1996) and Mosepele (2000, 2001), who observed that fishing nets are normally set for at least 12 hours overnight. Similarly, while Cerdeira *et al* (2000) observed that, while commercial fishers on average take 7-8 hours fishing in the lower Amazon, they normally spend longer time towards the end of the rainy season. However, during some parts of the year, commercial fishermen actively practice drive fishing, which is fairly labour-intensive: as described in Kolding *et al* (1996) and Mosepele (2000, 2001), this involves actively driving fish into the nets. Evidently, therefore, enterprising commercial fishers would need assistance in this activity. Furthermore, fishers who practise drive fishing, which is normally undertaken during the dry period, also spend fewer hours fishing (less than 8 hours), which is similar to Cerdeira *et al*'s (2000) observations in the lower Amazon. However, drive fishing is now prohibited in the Delta according to the recently promulgated fish protection regulations (DWNP, 2008).

4.6. Food Security and Health

Several studies (Baro, 2004; Forum SYD, 2005; Gordon, 2005; MAAIF, 2005) have shown that commercial fishers are more susceptible to HIV infection, with a possible outbreak of AIDS, because of their enhanced socio-economic status in the community. Moreover, their high mobility as they follow fish to better fishing grounds exposes them to risky sexual behaviour. Fishing communities in Africa have been described as 'hot-spots' for the spread of the HIV virus, not only because fishers are mobile, constantly moving between landing sites and water channels, but also because they live in fish camps away from family and societal sanctions. Some African fishing communities have higher HIV prevalence rates than 'known risk groups' e.g. truck drivers and commercial sex workers (Allison and Seeley, 2006, Tanzarn, 2006; Tanzarn and Bishop-Sambrook, 2003; World Fish Centre, 2006; Keulder, 2006). According to MAAIF (2006), fish availability can be dramatically reduced as people become too weak to fish (or eventually die) with a consequent loss of indigenous knowledge and fishing skills. Therefore, HIV and AIDS can have a multiplier effect, whereby productive pursuits such as fishing are severely curtailed with a resultant loss of rural employment and provision of food (Campbell and Townsley, 1996).

The fact that a majority of commercial fishers increases their fish catches as the first major strategy during food shortages, and the fact that a majority of commercial fishers sees fish as a major food strategy during periods of food shortage, suggest that not all fish caught is sold, but that some is

also consumed in commercial fisher households. This observation agrees with Cerdeira *et al* (2000), who observed that commercial fishers in the lower Amazon sell only 71% of their catch and consume the rest at home. This survey suggests that fish is indeed a major source of food security for rural commercial fishermen. Moreover, not only does fish give commercial fishers the purchasing power to procure food, it is also a source of cheap and yet high quality animal protein, similar to what Almeida *et al* (2001) observed in the lower Amazon.

It is because of this dependence on fish as a major source of protein that most commercial fisher households perceive their children to be healthier than children from non-fishing households. However, this high dependence on fish and fishing makes these households vulnerable to highly debilitating diseases such as AIDS. Being a labour-intensive vocation, fishing can generally be undertaken by healthy individuals only. It is therefore possible that commercial fishing, similar to what Ngwenya and Mosepele (2007) observed in the subsistence fishery, is also at risk from the HIV/AIDS pandemic in the Delta. This is based on the observation that a majority of households indicated that they have had terminally ill household members during the five years preceding this survey.

Chapter 5: Qualitative Interview Results

5.0. Introduction

This chapter gives a synthesis of the qualitative data obtained from semi-structured interviews in focus groups, from key informant interviews through participant observations, and a synthesis of the Okavango Delta Management Plan (ODMP) consultative *kgotla* meetings and stakeholder workshops.

5.1. Primacy of Fishing

Although fishing is only one of many economic activities (such as arable farming, livestock rearing, the production of crafts, the use and sale of veld products, and formal employment in the tourism sector), commercial fishers stressed during focus group discussions the importance of fish as a source of livelihood. During those discussions, commercial fishers unequivocally asserted that fishing is the most important source of their livelihood, and that they depend on fishing to meet the food and financial needs that sustain their families. This is not surprising as Okavango Panhandle villages lie along permanent open water sources; thus fishing plays a more prominent role in the household economy than in the temporarily inundated floodplains in the lower Delta.

It is important to note that commercial fishers echoed during focus group interviews some of the key issues that had been brought up again and again by villagers in different consultation meetings (in particular during the Okavango Delta Management Plan – ODMP) and community capacity-building workshops (in this case the BIOKAVANGO meetings). These included flow reduction; waterways and channel blockages; concerns over the invasion of salvinia molesta plants; destruction of livestock and plough fields by predator animals (such as lions, hippos, elephants, crocodiles, etc.); fishing methods; limited access to traditional fishing grounds; conflict between fish resource user groups; fish regulation skepticism; adverse impacts of unregulated recreational fishing (leisure or fishing competitions); and the intrusion of new arrivals/competitors (houseboats and self-drive tourist campers).

5.2. Fishing Methods and the Sustainability of Fish Stocks in the Delta

In general fishermen agreed on the need to use the fish resource of the Ramsar site in a sustainable way. However, they stressed that by applying their traditional fishing methods, the Okavango Delta waters had never been and would never be over-fished. If, indeed, fish stocks are declining, it is likely because of the reduced flood levels in the Delta. Fishermen were optimistic that, 'good floods in the past' bring 'large quantities of fish' and would continue to do so in the future. Commercial fishers argued that each flood regime determines the up or down nature of the fish population. In other words, variability in fish abundance depends upon the 'flood pulse'. The fishing methods discussed in the following sections were deemed appropriate to the sustainable utilisation of fish resources.

5.2.1. Fishing Methods and Fishing Assets vis-à-vis Conservation

5. 2.1.1. "Scavenging"

Commercial fishers were insistent that passive fishing, or 'scavenging' from drying pools or lagoons, is a non-impact and eco-friendly method that is common when water recedes in the flood

plains. As one respondent pointed out, 'the practice of *'picking' fish from drying lagoons/pools therefore is not seen as detrimental to the fish population, but rather as a 'wise' use of fish resource which could either die naturally or be eaten by birds.'*

5.2.1.2. Traditional Fishing Methods

The fisheries department has 'strongly' advised gill net fishers to use larger mesh gill nets astensibly to mitigate against recruitment over fishing but also to harvest marketable fish. But commercial fishers argued that 'most households in the villages do not have gill nets' because 'they are poor'. Gill nets are expensive, and poor people have no alternative sources of income. Traditional fishing methods do not result in over-exploitation of fish resources. They assert that *'when using* traditional *fishing methods - baskets, spears, hooks and lines - there is no waste of fish nor is there overexploitation. These methods are* not destructive *to the fish population'. Villagers do not fish during the fish-breeding season.'*

5.2.1.3. New Fishing Regulations, Closed Seasons, Zoning and Quotas

Commercial fishers support the idea of the issuance of fishing permits because this would help monitor catches accurately. But they are strongly against zoning and limiting the fishing season, as these would result in restricting their fishing operations and ultimately have adverse effects on their business, as they have few productive fishing grounds. They argued that zoning has very little to do with the conservation of fish, which can be achieved without imposing restrictions on fishing. Sometimes fishers will find one lagoon to be without fish and zoning would restrict access to other, better stocked, lagoons. Zoning would only aggravate the situation. Commercial fishers were concerned that one likely outcome of zoning would be a 'radical reorganisation' of the Delta, whereby on the one hand the practice could threaten access rights, whilst on the other would motivate hitherto unrecognised resource user groups, such as basket and subsistence fishers, to get organised and vie for official recognition and acknowledgement. The likely outcome would be that competition for access to fishing areas would increase rather than decrease, and conflict would be intensified rather than reduced. In the long run, all stakeholders would be losers! It would be a game without winners!

Further, they argued that fish breed throughout the year, making it illogical to declare a 'closed season' in order to enable fish to 'breed'. The fishers are also against the idea of 'closed fishing seasons' because the practice would adversely affect their business.

In contrast, the semi-structured interviews with fisheries field assistants revealed that they are in favour of zoning some fishing grounds in the Delta in order *'to regulate fishing activities of commercial, recreational and subsistence gillnet fishers but not basket fishers'*. Basket fishers, they argued, are seasonal fishers (fishing only during low floods) and are locality-specific. In other fishing areas there are no basket fishers (e.g. Seronga and Xakao), so zoning will therefore be of no relevance to this group. The understanding is that zoning would help regulate and/or reduce the number of commercial fishers, and would allow for monitoring exact catch sizes. Asked where zoning should be done, the field assistants pointed out that, in the past, there were undisturbed places where fish would be free to breed: Hugo Lagoon in Ngarange area and Ngonenga Lagoon (in the Seronga area) were good breeding grounds.

Fields assistants were also asked about what they thought the likely outcomes of zoning would be. Unlike commercial fishers, they pointed out that access rights would not be threatened because not all fishing areas would be zoned. Also, they asserted that competition for fishing grounds would not increase. Instead, fishing activity would be more productive and over-exploitation prevented. Zoning would make it possible for the fisheries departments to effectively monitor 'trespassing' by fishers from other communities (e.g. fishers from Ngarange fishing in Shakawe Lagoon), and to

monitor fish spawning and breeding grounds. With zoning, 'all stakeholders would be winners.' But field assistants also conceded that zoning and quotas could exacerbate 'mono species fishing' or 'high grading' by commercial fishers. Although they were not certain about the 'by-catch' (unintended catch) rate or how to monitor it, field assistants observed that targeting tilapia species could result in the over-fishing of bream and the under utilisation of other species. The discard numbers could either be high or low. But they trusted that commercial fishers' discard would remain low since they are likely to catch what they need.

Fisheries field assistants also strongly believed that fishing should be regulated, and mechanisms (e.g. a code of conduct to guide fisher group behaviours) to control the fisheries put in place without undue delay. Appropriate objectives for such a code of conduct would be:

- To protect fishing grounds;
- To prevent over-fishing;
- To protect rights of access;
- To allow for the peaceful resolution of conflict;
- To assist with co-management;
- To provide a forum for policy makers and fishers (the OFA is already in place);
- To harmonise environmental, social and economic aspects of fish resource use; and
- To develop environmentally sound fishing techniques.

Like the commercial fishers, fisheries field assistants believe that basket fishing is not good for conservation because 'they catch small fish using mosquito nets' (the nets also end up catching macro invertebrates). However, they were quick to point out that basket fishing per se has no environmental impact because of its scavenging nature, picking fish that is already trapped in drying lagoons.

5.3. Resource Access and Conflict

According to the Department of Fisheries field assistants, resource user conflict intensifies during the low flood season. Accusations and counter-accusations are rife. Commercial fishers accuse recreational fishers of using big engines, and recreational fishers accuse commercial fishers of over-fishing and disturbing their clients at night. Tour operators allege that unregulated fishing activities by commercial fishers reduce or 'deplete' fish stocks. They are particularly against the practice of 'driving fish into the nets' at night. Night fishing reduces their client's day catch size.

Commercial fishers acknowledge conflict between them and lodge owners on the one hand, and between them and houseboat owners on the other hand. Commercial fishers complained of a lack of adequate access to fishing grounds, with particular reference to individuals at Samochima lagoon (where there is a grape farm along the river) and Xaro (where there is a river-side lodge). With regard to houseboats, they also mentioned conflict with some houseboat operators who camp and deny them access into lagoons, such as the Gerera Lagoon near Drotsky's cabins. Commercial fishers allege that conflict with the grape farm owner and others from the village of Samochima is very serious. Conflict with the Xaro Lodge owner started during the establishment of the Boiteko syndicate, while conflict with the grape farm owner started in 2005. Recently in 2006 conflict has arisen with the advent of houseboats. These conflicts are usually season-specific and take place during low floods when they fish lagoons and the main channel. Technically, other fishing groups (subsistence, basket and recreational fishers) are less likely to fish in the main channels and thus do not compete much with commercial fishers. Conflict is likely to occur when commercial fishers fish in flood plains and lagoons. Unlike in Samochima, the Mohembo commercial fishers pointed out that they do not have any conflict with any other resource users with whom they share fishing

***Ngwesi* houseboat anchored near Samochima.**

Private property near Samochima lagoon.

Lodge in front of Samochima village.

grounds (basket, hook and line, subsistence gill net and recreational fishers). However, as already highlighted, conflicts associated with drive fishing and night fishing have been delt with by the fish protection relations, which prohibit these two fishing methods in the Delta.

5.4. Inter and Intra-Group Conflict

The lodge owners want fishing in lagoons to be banned or have the lagoons designated 'protected areas' so fish can spawn and regenerate. Their argument is that commercial fishers are depleting fish stocks in the Delta. Commercial fishers claim to be knowledgeable about breeding/spawning grounds, fish migratory patterns, and adaptation to human-induced water disturbances (such as from high powered boat engines). As far as the commercial fishers are concerned, lodge owners take their clients for recreational fishing in the main channel, where they are less likely to catch fish because *'ditlhaphi di botlhale, di siile'* ("fish are smart, they have moved away" to parts of the Delta where there is less human disturbance). The commercial fishers claim to know of numerous fish breeding grounds in the Delta, including 'fish reserves' which neither the fisheries division

technical officers nor lodge owners know anything about! This knowledge, however, is 'priviledged information' that works to their advantage. With regard to standing fish stocks in the Delta, both commercial fisher groups (Samochima and Mohembo) stated that fish would never be depleted as long as in-flows to the Delta remain high. However, they expressed concern that vegetation encroachment into fishing grounds because of a lack of burning as was done in the past prevents them from setting their nets efficiently and leads to lower catches.

The commercial fishers want to have basket fishers banned from fishing in the flood plains, allegedly because 'basket fishing is detrimental to fish stocks because they catch smaller fish with their baskets'. The use of mosquito nets by basket fishers should also be prohibited because they catch immature fish. They further suggested that basket fishers should always return smaller fish back into the river rather than discard them. Tourist angler's 'catch and release' method, depending on the type of hook used, is also alleged to cause 'injury' or 'stress', and is considered to have some detrimental effects on fish stocks.

Commercial fishermen felt that, apart from restricting the mesh size of fishing nets, there was no need for more control in the commercial fishing sector, nor for further constraints to traditional fishing practices. Field assistants were of the view that the indiscriminate discarding of catfish rather than controlled disposal on land, would lead to pollution. They also believed that recreational fishers catch and release injured fish, which become vulnerable to predators.

Part of the lodge owners' marketing strategy is to 'sell' a 'pristine' image of the Delta, where tourists can relax, sail up the main channel, and go fishing for recreational purposes (or engage in sport competitions, especially in Shakawe and Sepopa) using the standard catch and release method, without any disturbance. In reality, there are other resource users who are not featured in this promotion. Lodge owners must therefore try to minimise 'extraneous noise' from local communities who derive their livelihoods, seasonally or permanently, from the Delta river channels, and to satisfy the leisure needs of their customers.

5.4.1. Competing Knowledge Systems

Tour operators, commercial fishers and field assistants each claim to be endowed with local knowledge of the nature of fish stock in the Okavango Delta (as either in abundance or over-exploited), of fish habitat and ecology, and of migration, spawning and breeding grounds. Each hold different ideas about the conservation of fish resources and how to use the resource sustainably. Informal interviews with commercial fishers suggest that they have exceptional knowledge about fish breeding and spawning grounds, but unfortunately this resource has not been deployed by the Fisheries Division to influence policies or to formulate relevant intervention programmes. The BIOKAVANGO project could utilise indigenous knowledge obtained through anthropological data collection (which could authenticate the technical knowledge of fish biologists, for instance). Without a doubt, the indigenous technical knowledge of commercial fishers would be of vital importance to the BIOKAVANGO project. Most fishers have between ten and twenty years of fishing experience. Their knowledge of the Delta, developed over time, includes an intimate knowledge of the biology (that is, when, where, how and in what season to target preferred fish species using different fishing gear). Fishers also have detailed knowledge about fish spawning, breeding and feeding grounds, 'the storerooms'. The challenge, however, is to authenticate and apply this knowledge in order to map these fishing grounds. Input from these maps is necessary for fisheries legislation based on classical fisheries management regimes that do not threaten the major source of food security for fisher households.

5.5. Conflict Resolution Approaches

To date, commercial fishers and lodge owners have reached an impasse. Their issues of dispute have been presented and debated at length with the Department of Fisheries, the Department of Water Affairs, the Okavango Fisherman's Association (OFA), the customary court (*kgotla*) and with other development organisations working with communities in the area. These disputes emerged as 'hot spots' during consultative meetings held in fishing villages as part of the participatory process of soliciting input for the Okavango Delta Management Plan (ODMP), and have resurfaced in various consultative workshops and seminars organised by the BIOKAVANGO community capacity-building project. Currently, through the facilitation of the BIOKAVANGO project, an Okavango fisheries management committee (OFMC) was resuscitated whose main mandate is to create a forum for conflict resolution amongst the Delta fisheries stakeholders.

5.6. Key Issues from ODMP

5.6.1. Institutional Distrust and Failures, and Competing Knowledge Systems

From the above discussion, it is clear that different resource users view the issues differently. During ODMP consultative meetings, about 6.9% of all the concerns raised by communities were related to fish access, utilisation and conservation. When representatives of the fishery component talked about the introduction of new fishing regulations, the communities met the idea with skepticism, fear and a certain degree of resentment. As one respondent put it, *'we used to eat as much fish as we wanted without depleting it. Why should it be different now?'*

During focus group discussions, commercial fishers pointed to the threats to their livelihood posed by channel blockages. As one respondent put it, *'we cannot fish in channels overgrown with grass. Fire would help to remove the grass. Fish move into those cleared areas.'*

During the ODMP *kgotla* consultative meetings, it became clear that the role of the Department of Fisheries under the Department of Wildlife and National Parks (DWNP), was generally misunderstood, even by the commercial fishers. Villagers were dismayed at DWNP's inability to enforce existing fishing regulations and other national or international protocols relating to resource use in the Okavango Delta. When representative of the Fisheries Division mentioned fish stock assessment as one of the planned activities under the ODMP process, villagers were baffled by the idea on methodological grounds, and could not imagine how such an assessment could be carried out because 'fish are constantly moving'. But the dominating theme during the consultative meetings revolved around what villagers perceived as threats to fishing-based livelihoods.

5.6.2. Threats to Fishing Livelihoods

This section analyses data from consultative *kgotla* meetings (Bendsen, 2005). During the second round of the ODMP consultative *kgotla* meetings, a significant proportion of concerns (15.8 % of all the comments) related to the hydrology of the Delta (Bendsen, 2005). Villagers had observed long-term alterations in the hydrological regimes of the Okavango Delta, and speculated about possible factors contributing to the reduced water flow, the shifts in the flood distribution pattern, and the drying and wetting up of some parts of the wetland and its outlets. Interestingly, few communities identified hydro-climatic change, which could lead to reduced rainfall in the Angolan highlands, as a possible cause of diminishing water levels. All these changes were perceived as posing major threats to the sustainability of their fisheries-based livelihoods. These threats identified in the ODMP meetings are summarised below:

5.6.2.1. Channel Blockage, Controlled Burning and Zoning

The Department of Water Affairs (DWA) clears channels in order to access its water gauges that monitor flow within the Delta. However, villagers were of the opinion that these measures are

inadequate and do not take into account the adverse impacts that blocked waterways have on communities. Hence they felt that DWA should be responsible for the restoration of water flows and for opening up once navigable channels to facilitate fishing area access and the harvesting of veld products. Furthermore, the communities stressed that they would like to be more involved in identifying blocked waterways and participating in vegetation clearing activities. The negative impacts of uncontrolled veld fires (both in timing and extent) notwithstanding, villagers were of the opinion that controlled burning should be restricted to the floodplains. Examples of the effectiveness of using fire to control vegetation growth in watercourses and fishing grounds, and in the management of grazing and ploughing fields, were given. There is also a lot of distrust between commercial fishers and the Department of Fisheries regarding zoning and fish regulations. The fear is that 'zoning' will close off valuable fishing areas.

5.6.2.2. Socio-Economic Impacts of Wildlife on Farming

Even though a significant proportion of villagers are arable farmers, it is clear that the destruction of crops by wildlife has had a significant impact on the viability of farming as a livelihood option. Some villages have been hit harder than others. In the eastern part of the panhandle, villages such as Ngarange, Sekondomboro, Xakao, Kauxwi and Mohembo East have had their share of the destruction. During the second round of ODMP *kgotla* meetings, elephants were the biggest menace to arable farmers. Furthermore, *molapo* (or flood recession) farming is no longer allowed, and a 500m set-back from flood plains and river banks has been imposed. Although there is talk about a possible review of these regulation by the Land Board, communities in the area have been deprived of an alternative to rain-fed dry land farming. The likely outcome of this is increased pressure on fishing.

During the consultation in Ngarange village on 4th February 2004, in which 103 people (37 males, 66 females) were in attendance, one respondent after another lamented the destruction caused by wildlife:

> Elephants are causing a lot of damage to fields, and even to water tanks and borehole equipment. Elephants are also breaking the border fences. Government should increase its efforts to deal with this problem.
>
> Elephants destroy crops in the fields, and cause disturbances and threaten our lives in our homes and cattle posts.
>
> We have a lot of conflict with wildlife in this area. When we cultivate we lose our crops. If we do not cultivate we are told that we are lazy.
>
> There are too many elephants in our area. Numbers have drastically increased. They cause a lot of damage to field fences and crops, and even kill human beings. What plans are in place to reduce their numbers? Government should cull the excess number of elephants.

During a meeting in Sekondomboro on the same day, in which 87 people (38 males, 49 females) attended, these concerns were repeated:

> Some elephants entered my field and my wife reported the case to the DWNP office. I was shocked when we were told that no assessment would be made until the elephants had destroyed the whole field.
>
> Elephants in the area destroy the buffalo fence, and when cattle cross at these places they are seen as the culprits and get shot.

> I also can testify that when damage to my crops was reported to the DWNP office, my wife was told to leave the elephants to continue the destruction.

In a consultation meeting at Xakao on the 14th February 2005, in which 94 people (47 males, 47 females) attended, one respondent stated:

> The increasing elephant population is the main reason for the destruction of the border fence. The excess number of elephants should be translocated.
>
> When buffalo cross the veterinary fence, they are merely driven back, while cattle that enter the stock-free zone are killed. Government values wildlife more than the well-being of people.

In Kauxwi on the same day, 132 people (84 males, 48 females) attended, a consultation meeting. One respondent asked:

> How many elephants are in Botswana? Has the population been increasing or decreasing over the years?

Again in Mohembo West on 15th February 2005, in which 40 people (26 males, 14 females) attended, it was stated that:

> Elephants are constantly damaging the fences around our fields. So some of us have given up growing crops.
>
> Elephants and lions are the major problem animals to arable and stock farmers. Elephants destroy the fences around our fields and consequently livestock enter the field and damage our crops. The DWNP responds very slowly to our requests to attend to damage cases and to compensate farmers.

With regard to livestock farming, crocodiles and lions appear to be the major threats.

> In the Shakawe area, crocodiles are killing livestock and even people. Why does government not allow us to kill these beasts, which are of no use to anybody?
>
> Crocodiles should be considered as problem animals as they cause a lot of damage. I lost my cattle to crocodiles but did not report it as it was difficult to prove. DWNP officers do not take us seriously when we report to them, and this is an unfortunate situation. We sometimes do not even report because of the treatment we get when we inform them of cases of crop and livestock damage.

5.6.2.3. Access to Fishing Grounds

Unlike other fishing groups who have 'restricted fishing grounds' (such as basket and recreational fishers), commercial fishers are more versatile both regarding fishing grounds as well as fishing season, and fish in lagoons, floodplains and in the main channel. They share fishing grounds with subsistence fishers (flood plains) and recreational fishers (lagoons). By definition, a commercial fisher, in addition to fishing for sale using gill nets and motor boats, fishes at least six months per year and follows the fish deeper into the Delta. Restricted and/or lost access to traditional fishing grounds by the expansion of the Moremi Game Reserve also emerged as a threat to fishers, and was raised by a number of subsistence fishermen in the south-east of the Delta as a serious erosion of their traditional land use rights.

Commercial fishers also complained that private concessionaires prevent them from fishing in these areas, including from fishing in lagoons:

> We can no longer fish in our traditional fishing areas, but people from outside the community can utilise the resources of the Delta.

5.6.2.4. Control of Boat Movements

Increasing motor boat traffic was seen as a threat to people and to the ecology of the Delta. Communities requested stricter regulations on boat movements and on the type of boats permitted in the Ramsar site. They pointed out that fast-moving boats are dangerous to fishermen who use traditional dug-out canoes as a means of transport. The introduction of driving licenses for motor boat operators was suggested to help address this problem. Furthermore, commercial fishers expressed concern about the negative environmental impact of motor boats on endangered bird species like the African Skimmer. They had observed that the waves of big boats cause erosion of the river banks, and destroy the nesting sites of birds and crocodiles on the sandbanks. During the ODMP *kgotla* meetings, some speakers referred to the findings in the Panhandle Management Plan, which indicated that the formation of waves was not simply related to the size, but more to the shape, of the boat, and to the weight carried. It was pointed out that, despite the fact that boats have to be registered in a particular zone, movement regulations and the spraying of boats (for invasive species control) prior to translocation are not strictly enforced. Hence the danger of infestation of the Okavango system with aquatic weeds (in particular *Salvinia molesta*) remains high.

The following comments reflect concerns about houseboats made during the BIOKAVANGO Stakeholder Workshop held at the Shakawe Sub-land Board in Shakawe on 19th-20th February, 2007:

> Boats with big sized engines (e.g. 150, 200, 300 hp) coming from outside create big waves when moving, and no one knows what impact they have on the ecological system. These waves are likely to destroy the nests of some endangered birds, and breeding sites for fish.
>
> Are there regulations in place to control the use of houseboats? Additionally, these houseboats sometimes camp for two weeks in the water and are likely to dump human and solid waste in the river, which is not good because people use the water for drinking.
>
> Where do these houseboats come from? To whom do they belong? Have they been appropriately licensed?
>
> A lot of boats that originate from Salvinia-infested areas enter the Okavango. Boats registered in Francistown can be brought to Kasane, a Salvinia infested area, and later to the Okavango. Boats from outside the country should not be permitted to be brought into the Delta.
>
> A study carried out as part of the Panhandle Management Plan shows that the damage boats are causing to the river banks and to the breeding success of certain species does not depend mainly on the engine size but on the shape of the boat and on how heavily the boat is loaded.
>
> The houseboats are releasing their fluid waste into the river. Action should be taken by the Department of Environmental Health of the NWDC to avoid environmental damage. The storage capacity of the sewage tanks on board the houseboats can be determined and set in relation to the occupancy rate of the boat (bed nights).

> Big motorboats that move fast are dangerous to local river users in their dugout canoes. Only the boats of tour operators from the Okavango should be permitted in our area. Foreign boat operators do not follow the local regulations.
>
> Boats, boat engines and boat trailers are not always properly sprayed at the entry points into the Okavango. This might cause the spreading of Salvinia.
>
> The lack of regulations on the use of boats makes it difficult to prosecute cases of accidents in the Delta. In the training programmes for communities, a boat driving course and ways to acquire boat licences should be included.
>
> I heard that Salvinia occurs around Moremi Game Reserve. Since there is movement of boats between the Panhandle and Moremi Game Reserve who is monitoring this movement? There is reduced flow in the channels.

Informal interviews with commercial fishers suggest that they have a comprehensive understanding of hydrology, fish species, fish migration seasonally between flood-seasons, feeding, spawning and rearing habitats. Fishers know these things very well and use hydrological indicators to make decisions about their fishing activities.

5.6.3 Discussion of Key Issues

Threats to Fishing Livelihoods

Major concerns for commercial fishers included the restoration of the navigable channels/ waterways by opening up blocked channels to facilitate access to more productive fishing grounds inside the Delta, and the introduction of controlled burning in the floodplains. Fishers stressed that they would like to be more involved in identifying blocked waterways and participating in vegetation clearing activities. Conflicts between commercial fishers and private concessionaires and lodge owners with regard to access to fishing areas (especially lagoons) have been well documented (Bokhutlo *et al*, 2007; Mmopelwa and Ngwenya, 2008).

Regulating boat movements (especially for other water bodies to prevent of the introduction of invasive species) and licensing were also concerns. From the above discussion, it is very clear that fishers had observed long term alterations in the hydrological regimes of the Okavango Delta, and speculated about feasible factors contributing to the reduced water flow, the shifts in the flood distribution pattern, and the drying/wetting up of some parts of the wetland and its outlets. Ames (2003) points out, that fishers use other 'hydrological gauges', such as trees in the river channels, to measure water discharge and decide when and at what times to fish certain species of fish.

However, the fishers' ecological knowledge (FEK) of the Delta has been, and continues to be, marginalised. Garcia-Allut *et al* (2003) define FEK as the sum of data and ideas by a human group on its environment as a result of the group's use and occupation of the region over many generations. FEK typically includes not only categories of fish but also information on changes in fish behaviour, seasonal habitats, meteorology and time and space changes occurring in the marine environment. The current and future roles of this knowledge, and the various ways in which to integrate it into current management strategies, has been half-heartedly explored. Ames (2003) argues that indigenous fishermen's knowledge is often dismissed as subjective and anecdotal despite the fact that the scale, accuracy and breadth of their ecological knowledge is based on years of systematic observation. A framework is necessary on which to interpret information 'zoning', taking into account the fact that fishers are not a single cohesive group: They have different views and understandings of the hydrology of the Delta ecosystem. This implies that the benefits of

zoning must be clearly spelt out for them, and they must be active participants in the process, which must necessarily integrate their FEK into proposed fish/human conflict management regimes. As farmers, commercial fishers are confronted with other challenges which were voiced during the ODMP consultation process. These include the destruction of crops and livestock by wildlife. Kgathi *et al* (2004) argue that the destruction of crops by wildlife constitutes a shock which has dire consequences for farmers. The banning of molapo farming within a 500m distance from the flood plain also has had a significant negate impact on farmers. Livestock farming is susceptible to predators, especially lions. The status quo seems to suggest that commercial fishers are caught between a rock and a hard place.

The introduction of zoning and the closing fishing seasons as management tools is a very sensitive and contentious issue among commercial fishers. Marine protected areas (MPA) have been introduced elsewhere in the world, but there are still many questions regarding their effectiveness as a fisheries management tools. There is no conclusive proof to date that they help surrounding fisheries. An MPA may be established for other economic purposes other than fishing.

Commercial fishers lament that their ecologoical knowledge of the Delta is marginalised. Garcia-Allut *et al* (2001) define fisher ecological knowledge (FEK) as the sum of data and ideas of a human group about its environment as a result of the group's use and occupation of the region over many generations. FEK typically includes not only categories of fish, but also information on behaviour, ecology, metereology and references to time and space and changes occurring in the marine environment.

The current and future roles of this knowledge, and the various ways in which to integrate it into current management strategies, have been half-heartedly explored. Commercial fishers understand that fish migrate seasonally between flood-season feeding, spawning and rearing habitats. They have site-specific information at a local scale that needs to be merged with data from different parts of the Delta. Commercial fishers therefore have a comprehensive understanding of hydrology and fish migrations, and that fish species have evolved life cycles that are intimately adapted to the hydrological cycle of the river. Fishers know this very well and use hydrological indicators to make decisions about their fishing activities. Ames (2001) point out that the 'hydrological gauges', such as trees and rocks in the river channel, are used to decide when and at what times to fish certain species of fish. Rapid changes in water discharge is the main event, either directly or indirectly, that affects these gauges.

Ames (2001/2003) argued that indigenous fishermen's knowledge, such as that regarding changes in behaviour and distribution and seasonal habitats, is often dismissed as subjective, anecdotal and of little value to fisheries management strategies. Yet these same fishermen have spent much of their lives accumulating intimate, fine-scale ecological information that is not otherwise available. The accuracy and breadth of this knowledge have been found to be very impressive, and are pivotal to the development and function of sustainable fisheries.

There is a lot of distrust between commercial fishers and the Department of Fisheries. Building trust is a two-way process of sharing knowledge. Fishermen fear that zoning and fish regulations will be used against them, especially for closing off valuable fishing areas. A progressive framework for building trust is necessary, onto which the range of information, such as on 'zoning', can be interpreted. Moreover, fishers are not a single cohesive group. They have different views of the system they fish, and short- and long-term approaches to sustainability, based, at least in part, on their level of tenure in the fishery. The benefits of zoning and/or of integrating FEK must be clearly spelt out.

Policy Recommendations

Commercial fishing is an integral component of the rural livelihoods strategy in the Delta. There is therefore a need for sector specific policies to ensure that this source of rural livelihood and food security is mainstreamed into the general macro-economic development of the Ngamiland region.

1. There is a need to train commercial fishers in basic bookkeeping and financial management to ensure the sustainability of commercial fishing enterprises which are a major source of economic empowerment and rural employment

2. Government aid/grant schemes (i.e. FAP, LG17, AE10, etc.) were instrumental in developing commercial fishing enterprises in the Delta. The introduction of CEDA which has more stringent regulations may limit access to funding for (potential) commercial fishers, which may expose the rural fishing community to economic shocks.

3. Commercial fishing is an extremely labour intensive and time consuming exercise which is operated better by people in good physical condition. Therefore, HIV/AIDS education needs to be mainstreamed into fisheries extension activities to educate/sensitize commercial fishers about this disease which might have a negative impact on fishing operations.

4. There is a need to monitor fish marketing activities in the region and streamline these into general data collection exercises. Furthermore, there is a need to facilitate fish marketing infrastructural development in the Okavango region.

5. The role of women and children (especially boys) in commercial fishing has not yet been clarified and this needs to be done so that the role of this sector (i.e. commercial fishing) is highlighted. Moreover, issues related to child labour need to be streamlined into commercial fishing enterprises to ensure that the ILO charter is adhered to.

6. There should be a national fisheries policy that will map out management aims and objectives of commercial fishing in the Delta which would then aid the general management process.

7. Management interventions pertaining to commercial fishing need to streamline cultural fishing practices to ensure sustainable fish utilization.

8. There is a need for government to facilitate the production of a general code of conduct by commercial fishers and other user groups to minimize conflict between these groups.

9. The ecological/traditional knowledge of commercial fishers (and other user groups) needs to be integrated into the fisheries management regime of the Delta to ensure not only compliance from fishers but also sustainability in resource utilization which is ingrained in most traditional fishing practices.

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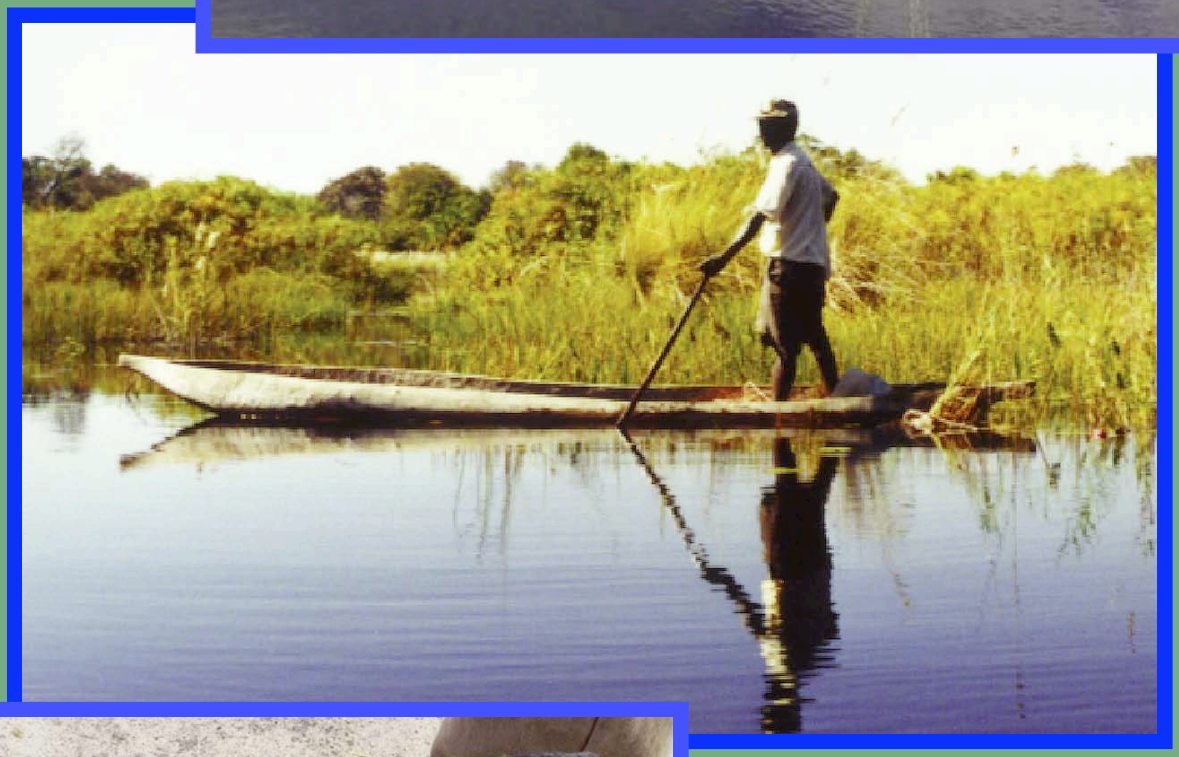

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