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HAROLD PUPKEWITZ GRADUATE SCHOOL OF BUSINESS

Strengthening of Fisheries Data Collection and Management in Namibia

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Leadership and Change Management in the Harold Pupkewitz Graduate School of Business
at the Polytechnic of Namibia

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August 2013

DECLARATION

I, Mr. Toivo Pendapala Uahengo, declare that the present work “Strengthening of fisheries data collection and management in Namibia” carried out under the guidance of Dr. Moses Maurihungirire is my original work and has not been submitted to any other Institutions for any degree.

Date: June 2013

Place: Windhoek

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June 2013

DEDICATION

This work is dedicated to my whole family; my lovely wife, Loide Ndiyakupi; son, Pendapala Erastus Peyonyofi and two daughters: Tuli Maya Ndina-Elago and Tumi Ndapandula Aishe-Oiwa for their undoubted love and support they have rendered me from the first day of this study.

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Abbreviations

ACOM: The ICES Advisory Committee for fishery Management

ASPM: Age Structured Production Model

BITNAM: Bull Information Technology Namibia

CPUE: Catch Per Unit of Effort

DOP: Directorate of Operations and Surveillance

DPPE: Directorate of Policy, Planning and Economics

DRM: Directorate of Resource Management

€: Euro

EU: European Union

EEZ: Exclusive Economic Zone

FAO: Food and Agricultural Organization of the United Nations

FIMS: Fisheries Information Management System

FOA: Fisheries Observer Agency

GDP: Gross Domestic Product

IBTS: International Bottom Fish Surveys

ICES: International Council for the Exploration of the Sea

IT: Information Technology

IVQ: Individual Vessel Quota

MCS: Monitoring, Controlling and Surveillance

MFCA: The Norwegian Ministry of Fisheries and Coastal Affairs

MFMR: Namibian Ministry of Fisheries and Marine Resources

MRA: Marine Resource Act

MSYL: Maximum Sustainable Yield Level

NA\$: Namibian Dollar

NAMFI: Namibian Maritime Fisheries Institute

NatMIRC: National Marine Information and Research Centre

NM: Nautical Mile

NPC: National Planning Commission

SADC: South African Development Community

SEEA: System for Integrated Environment and Economic Accounting

SWOT: Strengths, Weaknesses, Opportunities and Threats

TAC: Total Allowable Catches

UN: United Nations

UNEP: United Nations Environment Programme

US\$: American Dollar

ABSTRACT

This study focused on marine fisheries data collection, management and utilization which diminished the ability of fisheries to be effectively managed and leading to under-reporting.

The Delphi methodology was selected as the most appropriate means to achieve the goals and objectives of this study because it provided a way to solicit and gain consensus by experts on Namibian fisheries data collection and management.

The major findings were mostly the low interest of stakeholders in the data collection and management processes. Second, the Fisheries Information Management System (FIMS) where data is stored after validation did not allow any data analysis and reconciliation process of figures, so that had to be done manually by using other program not compatible with FIMS such as Structured Query Language (SQL), Microsoft excel or access.

The study recommended that an in-house training program needed to be arranged so that FIMS users would be able to appreciate the art of FIMS usage. Second, fishing companies as data primary producers would need to advance from manual data recording that would subsequently avail the data in timely manner or making the data easier to disseminate and analyze.

1 Chapter 1: INTRODUCTION

The Namibian marine fisheries stocks, not exceptional to other fishing production worldwide, are caught by large technologically advanced mid-water trawlers and deep-sea freezer vessels or processed offshore for value addition and exported to the consumers. According to the Food and Agricultural Organization of the United Nations (FAO), fish production has been on the increase since the twentieth century and reached its peak in 1996. Since then, the production has declined slightly and there are few signs of future increases as most of the marine resources worldwide are either harvested at their maximized yield or overexploited (FAO, 2010).

Overfishing is causing a worldwide decline in fish stocks and is considered both a severe threat to the environment and to the supply of food. FAO (2010) indicated that 32% of the global marine resources were either overexploited (28%) or depleted (4%) in 2008. More than half of the global marine resources (53%) were fully exploited and only 15% of the fish stocks are considered being fished at a sustainable level. Today, global production is making severe dents in marine food webs by targeting certain species and if current production levels are maintained, those actions could wipe out complete ecosystems (FAO, 2010).

1.1 Background

Namibia is located on the South West coast of Africa, a sparsely populated country of 2.2 million people (National Planning Commission [NPC], 2011), with the

exception of a few regions and large parts of the country that are classified as desert or semi-desert. The nature of its soils and climate thus make it unsuitable for arable agriculture. Its economy is largely dependent on fishing and mining and is not very diversified, because of inherited lack of differentiation and industrialization during colonization and its limited spectrum of known natural resources.

The fact that the country was ruled by South Africa prior to 1990 meant that there was little control over the lucrative offshore fisheries because no country would acknowledge South Africa's jurisdiction of Namibia's 200 nautical miles Exclusive Economic Zone (EEZ). As a result the fisheries operated as an open access resource and consequently fish stocks were severely depleted (Lange, 2003).

Following independence in 1990, the government embarked on a process of Namibianisation of the fishing industry. The key objectives of this policy were to grant rights to Namibian operators; provide employment for Namibian nationals, especially those disadvantaged by discriminatory laws and policies; and promote the export of value added products. Clearly, the focus of these policies was on developing a sustainable industrial fishing sector. Little attention was given to developing or supporting a subsistence fisheries sector as the general view amongst government officials was that there is no artisanal fishing sector in Namibia. Lack of development of a lucrative artisanal or subsistence fishery in Namibia is a consequence of both the hardy desert conditions along the coast and the high wave energy of the cold Benguela Current as depicted in figure 1. This would have contributed to the livelihoods of the

poor coastal communities in terms of food security, nutrition and economic development (Elago, 2004).

The fisheries management system in Namibia is based on property rights and non-transferable quota allocations. Fishing vessels must be licensed and the licensing system is primarily for monitoring and statistical purposes. To optimise on benefits, an appropriate and efficient fisheries management system is needed. Besides that, for fisheries management to be successful, it is essential that accurate fisheries information be managed and provided in a timely manner.

Without such information, it is impossible or difficult to monitor and evaluate the fisheries administration as well as to formulate good fisheries policy. In fisheries management, the main supply of such information is through monitoring of fisheries input (fishing effort) and output (fishing catch), which in most cases is referred to as fisheries statistics. Fisheries statistics are the foundation for gauging the social, economical, biological and environmental performance of the fishery (FAO, 2007).

Namibia's commercial fisheries are dominated by three species: hake (*Merluccius capensis* and *Merluccius paradoxus*), horse mackerel (*Trachurus capensis*) and pilchard (*Sardinops ocellatus*). Before independence (1990), there was little control over the more lucrative offshore fisheries because no country would acknowledge South Africa's jurisdiction over Namibia's 200-mile EEZ.

In effect, most of Namibia's fisheries operated as an open-access resource, and consequently, fish stocks were severely depleted. With no recognized EEZ, the offshore fisheries were dominated by foreign fleets, mainly those of Spain, South Africa and the former USSR (The Union of Soviet Socialist Republic or currently called the Russian Federation); relatively little economic benefit accrued to Namibia (MFMR, 2004a).

After Independence, Namibia established control over the 200-mile EEZ and a new fisheries policy was introduced.

This policy had two basic objectives of:

- ensuring ecologically sustainable management of fisheries;
- maximisation of benefits for Namibians from the fisheries sector, especially those previously excluded from the industry as a result of the South African discriminatory laws and practices.

To ensure sustainability, annual Total Allowable Catches (TACs) are set and strictly enforced for each directed fishery. To ensure that Namibians benefit economically, quota levies were introduced to recover resource rent (with subsidies for Namibians) and criteria for allocation of rights of exploitation were established that favoured Namibian ownership – especially Namibians previously excluded under the previous South African regime. Policies also created incentives to establish a fish-processing industry, which has been viewed as a potential source of economic growth. Under this system, a remarkable transformation of the industry was achieved in a

relatively short time. Fish stocks have stabilised and government is hoping to restore the stock to the much higher levels, last seen in the 1960s (MFMR, 2004a).

Fisheries also increased their economic contribution, accounting for four per cent of Gross Domestic Product (GDP) and 13 per cent of merchandise exports in 2010. Employment in the industry in Namibia has more than tripled between 1991 and 2010. The Namibian industry operates without subsidies and has increased its contribution to state revenue dramatically, rising from virtually nothing at independence to N\$114 million (US\$13 million) in 2010. This is more remarkable because of the global trend for massive government subsidies for the fishing industry in most countries. Hence, proper management of fishery assets is very important for the sustainability of Namibia's economy (MFMR, 2010).

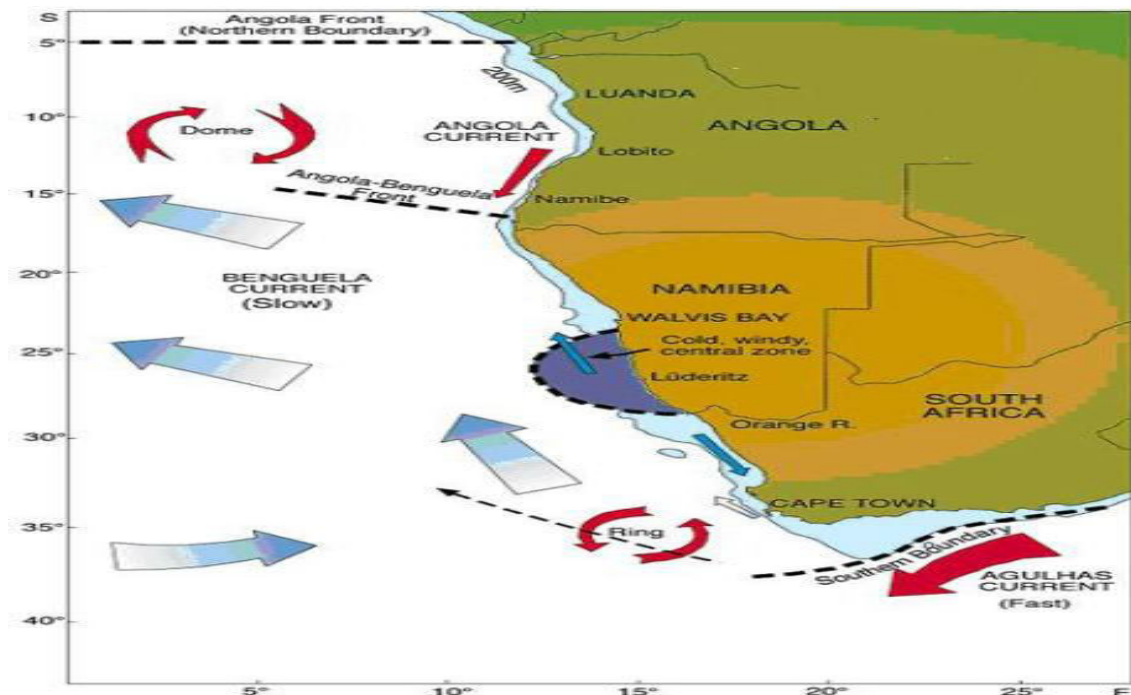
In the past, the income from harvesting fish would be included in the national income, but changes in the fish stocks were not accounted for. As a result of this practice, the pre-independence devastation of Namibia's fish stocks has appeared to be an economic success story because the economic value of the fish catch was recorded, but not the corresponding depletion of a valuable asset, such as the fish stock on which that activity was based (Edoff, 2012).

According to Edoff (2012), the widely recognized shortcoming of the system of national accounts has been addressed by the United Nations and other international statistical and economic organisations by the development of the System for Integrated Environmental and Economic Accounting (SEEA), which provided a framework for accounting for natural capital such as fisheries. An economic assessment

of the value of the fish stock, the economic loss incurred through overexploitation and depletion of the stock and the potential value of the stock under different management regimes was an essential tool for sustainable management. The environmental and natural resource accounts provide a useful tool for management by recording the value of both fishing activity and fish stocks (Edoff, 2012).

1.2 The Benguela Current

The Benguela Current system is one of the most productive habitats in the world, rich in pelagic and demersal fish. Marine fisheries are exclusively industrial and are a major contributor to the national economy (revenue was US\$114 million in 2010/11 and the industry employed some 13,300 people during the same period). The most valuable resources exploited are hake and horse mackerel and potential for sustainable yields of up to 1.5 million metric tons per year (MFMR, 2010). The country also has a small inland fisheries sector, mostly in the northern regions of Caprivi, Kavango and in the Zambezi river basin, where perennial rivers provide over 1 million hectares of flood-plain wetlands with fisheries potential of great importance for livelihood and food security (Lange, 2004).

Figure 1: The Benguela Current

Source: UNEP

According to Edoff (2012), the highly productive waters along the coastal line of Namibia have been popular fishing grounds on a commercial level for over a century. The nutrient-rich water of the Benguela current affects the marine life on the continental shelf of Namibia. The Benguela current is a nutrient-rich upwelling bordering to the Angola current in the north and the Agulhas current in the south. Both the Angola current and the Agulhas current are warm water currents flowing, from north to south and south to north respectively, towards the equator.

When the Benguela current deflects away from the coast it creates an upwelling generating the highly productive marine ecosystem. The different

characteristics of the three currents create different conditions for their ecosystems. Diversity is for example lower in Namibian waters than further south along the west coast of South Africa. However, many of the biological features are consistent over the whole geographical area of the ecosystems that hold both endemic and migratory species. The Benguela current system features a number of upwelling cells, where the intensity of the cells depend on winds and pressure fields, topographic features and the orientation of the coast. Seals represent the top predators and hake, squid, snoek and chub mackerel the piscivorous species in the food web along the coast (Edoff, 2012).

1.3 Research problems and objectives

The prevalence of major gaps in the reporting and cataloging of marine fish landings despite the fact that fishing quotas are allocated rationally in the Namibian fishery prompted this work.

A study would thus be needed to research the Namibian marine fisheries data collection, management and utilization. The Ministry of Fisheries and Marine Resources (MFMR) allocates fishing quotas to right holders based on their proposed plans as how to reduce unemployment by indicating the number of potential jobs to be created for Namibians, their commitments to social responsibility and community' upliftment and promise to adhere to standard rules. Payments of quota fees ultimately contribute to the country's Gross Domestic Product (GDP) (Elago, 2004).

The MFMR can only monitor and evaluate the process through proper management and collection of fish landings per species per respective fishing season. Currently, there are gaps that serve as loopholes for fishing companies to employ more temporary or seasonal workers than permanents and or delaying or dishonoring the payment of quota fees. As a consequence, a number of fishing companies are indebted to the MFMR because of unpaid quota fees; however they continue to be allocated their annual fishing quotas.

The MFMR, together with assistance of other countries' experts such as Norway, has managed to put in place the Fisheries Information Management System (FIMS), where information is stored and retrieved for analysis and reporting. However, the system's efficiency is still to be improved (Fisheries Statistics Committee minutes, 2009).

The following bottlenecks have been a source of concern since FIMS's inception in 1998:

- ✓ the current process for data collection and validation is cumbersome, since many entities are involved such as Inspectors, Right holders (fishing companies), Statisticians, other MFMR Officers;

- ✓ the pathway for validation is complicated and not linear as the fisheries statistics division is situated 300 and 800 kilometers away from both Walvis Bay and Luderitz fishing companies respectively (main sources for marine fisheries data);

- ✓ marine fisheries landings data flow are often delayed at times up to more than three months after being landed that leads to under-reporting;
- ✓ the FIMS, where data is stored after validation does not allow any analysis and reconciliation process of figures, so this has to be done manually, utilizing software not compatible with FIMS (e.g. Excel); and
- ✓ the staff members working with the system are specialized in data typing, but lack further knowledge to process and analyze data.

The objective of this study is thus the investigation of:

- what best practice for fisheries management and reporting is;
- causes for under-reporting on the fisheries industry;
- policies used to control the fishing industry worldwide (especially Norway);
- policies in place in Namibia; and
- strategies in place for dealing with under-reporting; in order to prevent the lack of data flow leading to under-reporting in the fisheries.

1.4 Significance of the study

The major goal of this work focuses on marine fisheries data collection, management and utilisation by improving the FIMS characterised by a number of weaknesses, which diminished the ability of fisheries to be effectively managed and leading to under-reporting.

2 Chapter 2: LITERATURE REVIEW

This chapter presents a review of literature focusing on: 1) Namibian fishery institutional framework; 2) Fisheries management system; 3) Best practice for fisheries management; and 4) Policy or Legal framework in Namibia.

2.1 Namibian Fisheries Institutional framework

Fisheries in Namibia is under the MFMR, set up in 1990, with the mission of strengthening Namibia's position as a leading fishing nation and contributing towards the achievement of economic, social and conservation goals for the benefit of the country.

The MFMR has four Directorates: the Directorate of Resource Management (DRM) responsible for scientific research and advice; the Directorate of Operation and Surveillance (DOS) responsible for monitoring, control and surveillance; the Directorate of Policy, Planning and Economics (DPPE) responsible for planning activities, which including advice on socio-economic issues for policies and legislation; and the Directorate of Aquaculture.

Namibia has also a National Marine Information and Research Centre (NatMIRC) located in Swakopmund and Namibian Maritime Fisheries Institute (NAMFI), both providing training for professionals of the sector.

2.1.1 Information Technology (IT) Division in the MFMR

The IT Division in the MFMR plays a critical role in overall fisheries information management. The Division is managing the official information system, running the help-desk service, managing IT infrastructure and overall information communication technology connectivity. All system, information technology infrastructure and database related matters converge on the IT Division. Thus, the IT Division serves as the transmitting belt for all database related training. The support service that the unit provides is indispensable for future sustainable use of the Fisheries Information Management System (FIMS).

2.1.2 Data gathering and producing divisions

Collection of fisheries data, particularly landings and logsheets data is centralized and so carried out by Fisheries Inspectors with aid from Fisheries Observers. Production is however decentralized. Biological data feeds into research sections of the Directorate of Resource Management and catch data to the Statistic Division within the Directorate of Policy, Planning and Economics.

The main role of the data producing divisions is to ensure that there is continuous flow of high-quality data and information. Data flow has been particularly problematic and quality dimensions such as accuracy, completeness and timeliness have deteriorated. There is thus urgent need to devise measures to embed quality considerations in managing the flow of information, starting with the data collecting process.

2.1.3 Data suppliers or providers

The fishing industry is to cooperate with the MFMR in supplying accurate data. This is usually achieved by using different methods including marine resources regulations to discourage non-compliance. In so far as data suppliers play this critical role, they have to be streamlined into the process to garner common understanding. As data is supplied for a legitimate purpose, there is obligation on the MFMR to provide aggregate information to the industry.

2.2 The Namibian fisheries management system

Foreign fleets dominated coastal waters before Independence. Uncontrolled fishing took place. Spanish, Soviet, Portuguese, South African, Romanian, Polish and Bulgarian vessels contributed to a severe reduction of all major fish stocks (Nichols, 2004).

The South African occupation regime also controlled all of Namibia's inshore marine resources leaving Namibia with depleted fish at the time of its independence (Nichols, 2004). Shortly after independence the newly elected government quickly founded the MFMR, a governmental fisheries administration organization, which is mandated to sustainably manage the living aquatic resources and promote the aquaculture sector (MFMR, 2010).

The policy framework that was created then emphasized sustainable utilization of the fisheries. Four main strategies were crafted to ensure a

long lasting contribution to the country's economy through fishing as one of the contributing factor (Nichols 2004).

The four crafted strategies are as follow:

- rebuilding fish stocks through the use of up to date research facilities and methods, monitoring territorial waters and conservative fishing effort levels;
- building a domestic processing industry;
- namibianisation, a policy saying that the government would make sure ownerships of companies, vessels, and new jobs were passed on to Namibian citizens; and
- empowerment, making sure the all social groups is represented in the industry, especially the previously disadvantaged.

Since then fish stocks have stabilised and by maintaining and carefully executing conservative management policies the government is hoping to restore much higher levels, last seen in the 1960s (Lange 2003). The Directorate of Operations of the MFMR showed successful work with monitoring, control and surveillance (MCS) and the system has gained a solid reputation as being one of only a few well functioning MCS systems in Africa (Bergh & Davies 2004). Twenty-three on-shore processing plants were built between 1990 and 2003, employing about 8000 people of whom nearly all were Namibians (Nichols 2004). Onboard the fishing vessels there were about 5600 people employed in 2003, of which 68 per cent were Namibians, adding up to a total of 13 500 people working in the sector.

Lange (2004) argued that extending and taking control of the EEZ at independence has had a significant impact on Namibia's national wealth. Bringing the fisheries under national control, contributed to an increase in wealth between 1980 and 1998, which Namibia otherwise would not have experienced. As the value of natural capital is quite volatile, changes in natural conditions and on international markets make fisheries contribution to the Namibian economy unpredictable. After independence, fisheries contribution to GDP has been fluctuating with a slight decrease from 5% in 2009 to 4% in 2010 (MFMR, 2010).

However, Lange (2004) also highlights the less impressive decrease in per capita national wealth since the 1980s the fisheries production in Namibia has decreased slightly since 1993, which leads to the assumption that the increase in contribution to GDP has been gained from an efficient management regime of the fishery. The fisheries sector in Namibia has since independence consistently been the second largest export sector (NPC, 2011). Fish and fishery products to a valued of N\$ 2106 million were exported in 1999, which was six times greater than at independence. Over the next seven years exports increased to a valued of N\$ 3883 million making the sector the second fastest growing sector behind tourism (MFMR 2006).

Meyn (2005) emphasises that many African countries fail to manage their resources efficiently and thus do not become more integrated in the global value-added chain. She found out that when many of these countries export mainly unprocessed fish, Namibia has continued at least to present value added fish and fishery products to the international market. She further argued that Namibia has not increased

the manufacturing activities it envisioned. A more all-embracing product development and better marketing could, according to the author, make the products less exchangeable on the international market and hence increase the bargaining power of retailers.

According to Meyn (2005), a move towards a more retail orientated manufacturing would increase employment and enable producers to create own brands and become more involved in marketing and distribution.

Lange (2004) also investigates the variation in fish stock sizes during the period 1990 to 2000. The results of environmental accounting for three major commercial fish stocks in Namibia show that only hake had a positive change during the period. Both horse mackerel and sardine fell below their 1990 levels. Lange (2004) emphasised how difficult it is for a government to master the balance of pressure for increased fishing quota allocations from the industry and the danger of further collapse that comes with it. A large amount on inter-annual variation in stock makes it even more difficult to manage the fisheries and the zero Total Allowable Catch (TAC) of sardines in 2002 proves that environmental accounting is complicated. During the first decade of the 21st century there has been great variation in the major fisheries. Sardines are still in a precarious state and the TAC was set to a low 10 000 tonnes for 2007 (MFMR 2007).

The improved status of hake enabled Namibia to enjoy increasing catch sizes for five years before returning to late 1990s quantities. In 2007, the opening stock was well below its 1990s level.

Lange (2004) admitted that Namibia in a short period of time has succeeded in establishing a sustainable fisheries management system that is relatively well enforced. The system has increased the economic contribution to the Namibian economy while avoiding subsidisation. However, Lange (2004) also finds it unlikely that the country will be able to restore its marine resources to previous highs anytime soon. Edoff (2012) meant that restoring the stocks to those previous levels is a long-term process but is highly affected by biological fluctuations in stock sizes. He argues that the harvest levels, that are set to help stock sizes return to their maximum sustainable yield (MSY), are set without a proper idea of what those MSY stock sizes should be.

Pauly *et.al* (2005) show a more widespread concern towards the fisheries science community in the region. They argue that there has been a lack of attention to earlier states of the resources in West Africa, affecting the information of which fisheries scientists base the TACs on. The problem, they argue, is that fisheries scientists accept the stock size and species composition at the beginning of their career as a baseline to evaluate changes. Instead, they should acknowledge the exploitation patterns and trends when formulating management advice. Edoff (2012) acknowledges that further development in research and management is necessary, especially research on transboundary effects on fisheries for which scientific co-operations amongst neighbouring countries will be needed. However, he also praises Namibia's achievements in training marine fisheries scientists and highlights the fact that the Namibian research programme is central in other international programmes.

However, a report from the Benguela Current Large Marine Ecosystem programme (BCLME 2005) found that Namibia does not possess sufficient fisheries managers, nor does it have necessary development initiatives in place to train and develop young fisheries managers.

Armstrong *et al.* (2004) investigated the costs and benefit from the implementation of the Namibianisation policy. Since the policy came into effect, both employment and ownership of Namibian-owned licensed fishing vessels have increased. The policy's flaw is the non-transferable quota system which is bypassed through leasing of quotas from quota owners to more established firms with vessel licences (Arnason 2002). This disturbs the investment climate the government intends to improve. But regardless of the policy's imperfection the gains from allocating quotas to many smaller producers are greater compared to the gains from allocating them to the already established firms. This is due to multiplier effects in the economy, especially in employment.

The quota allocation to the previously disadvantaged came with fee rebates so that the quota holders could quickly generate substantial income. Armstrong *et al.* (2004) found that the Namibianisation policy also in this perspective is performing well since the difference in potential and actual quota fees is increasing, indicating that fewer fees are being collected. The authors' critique focuses on the lack of rent the industry captures in its current state. They mean that the little rent captured goes to a few rich operators instead of the majority.

Olsen (2004) explains and clarifies how the institutional framework of the Namibian FMS came to place after independence. Her research, based on interviews from 1997-98 and 2000, describes the industry's experience and expectations regarding their participation in the management process within the new institutions. She finds that, though the purpose is to involve the industry in the decision-making process, there is a general dissatisfaction with the institutional arrangements. Lack of communication with the ministry is a reoccurring complaint from industry representatives who find the institutional structure so rigid and often inefficient that responses from the ministry take far too long time. Olsen argues that some pre-independence bureaucracy prevails as civil servants from before independence continue to retain their posts and privileges.

2.2.1 The current situation of fishing rights

Fishing rights are currently subject to the seven, 10, 15 and 20-year conditions. During the applications of 2002, the Ministry noticed that the fishing industry was contributing to social welfare and to the economic growth of the country. In a speech, the then Minister for Fisheries said that he was pleased that participants in the sector generally did not entertain greed and selfishness, but accommodated each other (Elago, 2004).

It was a positive sign that people did not only enter the fishing industry for the sake of a business venture, but also to contribute to the economy and development of the country. This is done through investment in infrastructure and human development, vessel upgrading and social contributions.

According to Elago (2004), noted that some fishing rights holders had failed to keep the promises made in their initial application and seemed interested only in short-term financial returns by ‘selling out’ their quota to others and not creating new jobs.

The conditions related to the different terms of the Namibian fishing rights are (as stipulated by Armstrong et al., 2004) as follows:

Seven-year rights:

- i) Applicants with less than 50% Namibian ownership of vessels or onshore processing plants in the fishery where rights are granted; and
- ii) Applicants with less than 51% Namibian ownership in the venture without significant onshore investments in the fishery where rights are granted.

10-year rights:

- i) Applicants with at least 50% Namibian ownership of vessels or onshore processing plants in the fishery where rights are granted; and
- ii) Applicants with less than 51% Namibian ownership in onshore investments in the fishery where rights are granted.

15-year rights:

- i) Ventures that are at least 90% Namibian owned with significant investment in vessels or onshore processing plants (50% ownership in facilities in the fishery where rights are granted, is seen to be significant);
- ii) Namibian rights holders with small shares in larger ventures;
- iii) Majority foreign owned ventures with the capacity to make a major contribution to economic and overall development in Namibia (onshore employment of 500 Namibians is seen as a major contribution); and
- iv) Smaller joint or wholly foreign-owned ventures, which can make innovative contributions to the development of the fishing industry in Namibia, such as developing new products or export markets, and where a long-term right is necessary to secure the investment involved.

20-year rights:

Ventures that fulfil the 15-year terms and employ at least 5000 permanent employees in onshore processing facilities

It is worth noting here that if a certain company or venture is granted seven-year rights and later fulfils the conditions for longer-term rights, then the rights may be extended by the Ministry of Fisheries. Similarly, if an enterprise no longer fulfils the criteria for which the rights were granted, the rights may be withdrawn or shortened.

According to Elago (2004), the government is unlikely to deny rights from previous allocations if they have become functional and are an operating part of the industry as a result of their investment in vessels and onshore-based plants or facilities. It is believed that doing so may lead to a collapse of the industry as it would undermine confidence and result in a halt in long-term investment. There is a high degree of confidence that rights will be renewed although it is not guaranteed.

Furthermore, even though there is a 20-year rights category, none of the companies in Namibia yet fulfils the requirements to be granted 20-year rights. In the future, companies must work towards employing at least 5000 employees permanently in onshore processing facilities in order for them to qualify for the 20-year rights. This will be a milestone for the government of Namibia, reducing unemployment and at the same time increasing the GDP of the country (MFMR, 2010).

2.2.2 New entrants, historical user groups, foreign ownership and joint ventures

New entrants in the Namibian fishing industry are persons who entered the fishery after 1994, when the new government called for applications for fishing rights; whereas historical user groups are those that were granted rights in 1978 under the South African Administration and have worked in Namibian waters since. Historical user groups in the Namibian fishing industry needed to co-operate with the new entrants to have a high guarantee on their fishing terms.

As a result, most of them have gone into joint ventures with the newly established Namibian companies. In these cases, the Namibian companies guarantee fishing rights, while the historical user groups secured the financial ground and expertise to operate the company. In accordance with Namibia's Marine Resources Policy, a joint venture is a partnership between foreign and Namibian "participants" which presents opportunities such as financing, capital investment and transfer of knowledge to the Namibian counterpart whilst it provides the foreign counterpart with access to the Namibian fish resources (MFMR, 2004b).

The fisheries policy of Namibia is aimed at increasing benefits for Namibia, especially through onshore development (MFMR, 2004b). This is an approach that aims to provide increased opportunities for Namibians to participate in fishing and related businesses and also to provide scope for foreign investment through joint ventures or wholly-owned foreign ventures in onshore processing.

Namibians are now the majority holders of fishing rights in the entire fishing sector. The majority are benefiting through the Namibianisation and empowerment policies in the fisheries sector. Others acquired shares in older companies' directly by individual shareholders and/or indirectly through investment representing Namibian majority-owned trusts/community projects. Some of the Namibian companies lease out their quota to older bigger companies, which are already well established. In other words, there are a number of rights holders in the Namibian fisheries that do not operate independently (Meyn, 2010).

This is commonly known in the Namibian fishing industry as “joint ventures” or “operation agreements” between new entrants and the historical groups who have the knowledge and skills. However, such arrangements usually lead to some stakeholders not being engaged in the actual harvesting operations (MFMR, 2010).

In the absence of financing options, companies may have leased their quotas in order to build up capital for investment in their own harvesting potential (Elago, 2004). This shows that some earnings from the industry go to smaller companies and other shareholders, who by and large have no active involvement in the industry. Many foreign investors continue to find valuable opportunities for investment in the sector through partnership with Namibian companies in joint ventures.

Government policy on investment, particularly foreign direct investment, remains of great importance such as the problems associated with fixed investments. This does not incorporate the notion of financing constraints, but rather assumes that firms are free to borrow as much as they please. If they are unable to borrow over a certain amount, this can restrict the amount of investment, making it more sensitive to economic fluctuations. An example of this in the fishing industry can be where there are financial constraints and low market prices that may necessitate retrenching workers, due to lower profits. If firms think that the low market prices are short-lived, they will borrow to continue their investment. Still, financing constraints limit their ability to do this and make the rate of investment much more volatile (Elago, 2004).

2.2.3 The role of MFMR in fishing rights allocation

The MFMR's main aim and role is to encourage further development in the fisheries sector. Its role is also to introduce new measures to encourage further investment in land-based fish processing in order to increase employment and the overall earnings of Namibia (MFMR, 2004).

With the powers given to the Minister for Fisheries and Marine Resources, according to the Sea Fisheries Act of 1992 and the Marine Resources Act of 2000, the Minister may decide not to renew fishing rights, terminate them or suspend them at the expiry date or anytime he sees fit. This seems to motivate less confidence in investing in the sector, especially if you have been granted short-term rights.

On the other hand, this can be an influential way to counteract those who join the industry and do not work hard towards investing in the sector. It can be argued that once the right holder is granted short term fishing rights for instance five years, the investment would also be made in a relatively short period; less than five years as there are no firm guarantees that the fishing right would be renewed. The right holder may decide to invest with the confidence that his/her fishing rights will be renewed after its first expiry but this only applies to big companies that have operational for decades and with large numbers of employees.

Thus, most new right holders may think of earning only enough for that short period without caring what is likely to happen when their fishing-rights are due to expire. Hence, new fishing rights holders feel that the fishing industry is very

challenging because the local commercial banks are very reluctant in rendering loans that would assist their operations to prosper. The main concern raised apparently is collateral which must be made on paid up properties or fixed investments in an amount of cash equivalent to the amount required or more.

2.2.4 The granting of fishing rights by the MFMR

From the conditions of granting fishing rights, the MFMR looks at investment in onshore processing plants and vessels. The rights are also granted in accordance with the Namibian citizens' shareholding (by percentage) in large venture companies. When the percentage of Namibian citizens is great, there is a better chance that longer-term rights will be granted.

Elago (2004) maintains that lack of capital and collateral to buy vessels or processing machinery to be granted longer-term rights is a problem in the Namibian fishing industry. Even if capital markets were perfect and loans were granted on equal terms, operational costs would be higher as a result of a lack of experience among the Namibians.

2.2.5 Overview of the Namibian commercial fisheries

The Namibian coastal waters are exceptionally high in quantities of plankton, which accounts for the abundance of Namibian commercial species such as Demersals, Mid-waters and Pelagic fisheries. Following the independence of Namibia in 1990, the declaration of an EEZ of 200 nautical miles and the full control obtained over the marine resources, the development of the Namibian fishing and processing

industry was made possible and became the fastest-growing sector of the Namibian economy in terms of employment, export earnings, and contribution to GDP.

2.2.5.1 Demersal Fishery

- **Vessels licensed**

Around 128 demersal trawlers (19-77m length) are currently licensed. Their principal target species is hake (*Merluccius capensis* and *M. paradoxus*), caught in deeper water (trawling is not permitted in less than 200-m depth). Smaller trawlers fish more inshore for monkfish (*Lophius spp.*), sole and kingklip. 17 demersal long-liners (19-55 m length range) also target hake, with smaller quantities of highly valuable kingklip and snoek.

- **State of the stock**

Hake is mainly exported in the form of frozen fillets (skin on and skinless); and other product-forms such as headed and gutted; baby hake; cutlets; tails; minced; blocks; sausages; glazed hake steaks; pin bone in and pin bone out; wings, roes and prime quality, fresh chilled products (MFMR, 2010).

Monk right holders have managed to secure joint venture operations with European marketing companies. The monk sector has established international marketing channels, which stretch as far as Europe, Far East (Singapore and Korea), Australia, America and more locally, SADC (MFMR, 2010).

Whilst Crabs are cooked, frozen and packed on board the vessels and exported to markets such as Japan, China, and Spain etc. Live crab processing and handling is quite different from the frozen whole and flakes. Crab is also sorted into live and exported in that form. They are exported to markets such as Malaysia, Singapore, Middle East, South Africa as well as USA. The Japanese buyers prefer frozen portions, live crab, and frozen mince/flake while the Chinese only prefer frozen portions. The companies have also shown the desire to export to Europe but indicated that prices are not as good as in the other export markets. Crab prices increased during 2011; live crab cost N\$250/kg compared to N\$185/kg in 2010 while frozen/whole crab's price cost N\$172.5/kg (MFMR, 2010).

The January/February 2010 swept-area biomass survey showed the total relative abundance estimates to be around 1 million tonnes, 29% lower from the previous year of 1.4 million tonnes. This decrease in abundance was a result of a 43% decrease in the non-fishable part of the stock (hake size <36 cm), otherwise the fishable part (hake size >35cm) increased by 12% (MFMR, 2010).

The 2010 survey estimates of the recruitment potential (2008 cohort) was just above the long-term average, at about 4 billion small fish, and almost similar to the estimates from the seal scats samples, at about 5 billion small fish. Barring some severe environmental conditions, the cohort detected during the 2009 survey (2007 cohort) is expected to recruit to the fishable stock by the year 2011 and replenish it remarkably (MFMR, 2010).

The long-time series catch rates (CPUE, which is used as an index of stock abundance) has continued to show recovery and has shown a very remarkable increase for 2010.

By considering all the available data from 1964 to 2009/10, the age structured production model (ASPM) estimated the status of the Namibian hake stock to be below the state of the stock in 1990, while the overall stock indicator is way below the maximum sustainable yield level (MSYL).

Although some improvement is noticeable (total biomass, fishable biomass, CPUE, sizes), the hake stock is still in an undesirable state and needs to be rebuilt to sustainable levels. Noteworthy, conservation measures introduced at the beginning of the 2006/2007 season (closed area, closed season and reduced TAC) are proving to be effective and need to be kept in place in order for the stock to improve (MFMR, 2010).

November 2010 biomass survey estimates show that the monkfish stock has declined by 11% (45 000 to 40 000 tonnes) since the last survey in November 2009. As length at 50% maturity is estimated to be around 30 cm, about 40% of the estimated biomass in 2010 was immature fish an indication of good recruitment (MFMR, 2010).

The 2009 crab-fishing season progressed well. Although monthly catches were variable throughout the season, the relatively high monthly CPUEs ensured a good catch rate. Samples taken directly from the commercial catch

showed slight changes in population attributes, the most significant of these being the decreases in numbers (sample sizes) and average size of both male and female crabs from the 2008 season to the 2009 season. The fisheries independent data collected via the annual biomass surveys generally supported these two trends.

Unfortunately very limited recruitment (crabs <60 mm CW) data was recorded during the 2008 and 2009 biomass surveys, the majority of this being male crabs. Opposing trends were obtained from the two biomass determining models applied to the 2009 data.

The fisheries independent (trawl) data indicated a minor decrease in the overall fishable biomass whereas the commercial data predicted a moderate increase in the overall fishable biomass from the 2008 to 2009. This increase continues on the trend of the proceeding five seasons where the upward trend indicates signs of a recovering stock (MFMR, 2010).

Biological indicators revealed normal lobster distributions of samples taken on the fishing grounds. There was a marked decline in catches (from that of the previous season) on the northern and central fishing grounds, but this is believed to be an effect of environmental variables influencing the feeding behaviour of lobsters and not necessarily a density factor.

Pueruli settlement was very low during the 2009-10 period, while the commercial data predicted increases in both the new and full recruits during

the 2009-10 season as well as a noticeable increase in the overall fishable biomass of the resource (MFMR, 2010).

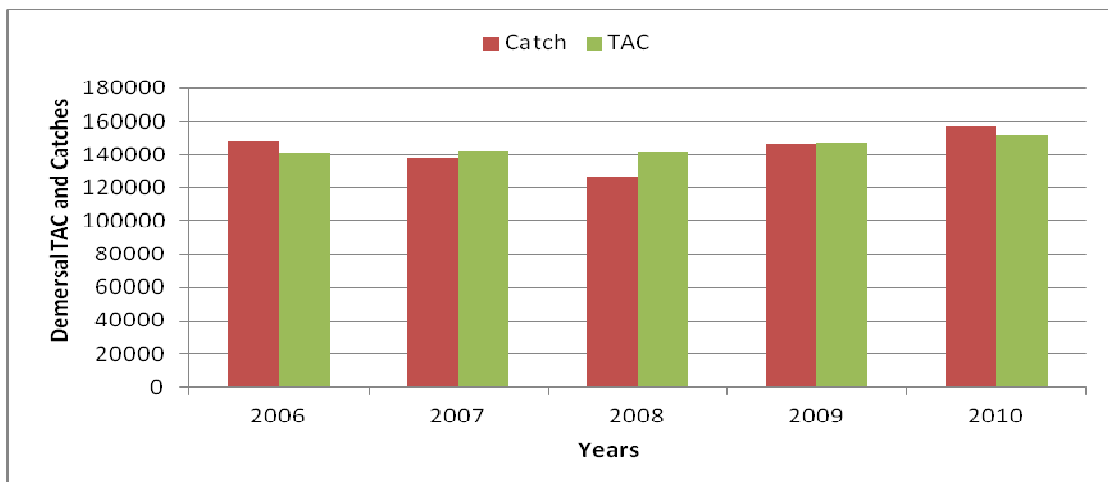
Despite the slight decreased in biomass estimates in 2010, the CPUE has increased while the catch at length data indicates a healthy stock for all demersal fisheries except for Orange Roughy which is temporary on moratorium of non fishing to allow the fishery to recover sustainably.

- **Number and duration of fishing rights**

As from September 2010, no company has been allocated more than 20 years fishing rights. Demersal fisheries are granted rights of seven, 10 and 15 years to 20, 10 and 51 right holders respectively (MFMR, 2010).

- **Catches and Total Allowable Catches (TAC)**

Figure 2: Demersal annual TAC and total landings, 2006-2010



Source: MFMR, 2010

Demersal are the second largest of Namibian fisheries TAC with 152975 metric tonnes granted during 2010 period. Out of that, hake received 140000, which are being processed both onshore and offshore. Value addition on hake fisheries allowed more fish processing offshore which in turn employed many Namibians in fishing industries (MFMR, 2010).

Approximately 157334 metric tonnes of demersal fisheries have been caught during the 2010 period. Thus implied three per cent over-caught during the period under review. Out of that, hake has landed 146353 metric tonnes, which is 6353 metric tonnes more compared to the TAC granted.

- **Employment**

Demersal fisheries employed 9842 workers and more than ninety percent are Namibians. That figure has included both demersal workers employed on both onshore and offshore with a large number recorded in fish processing factories and offshore vessels (MFMR, 2010)

2.2.5.2 Mid-water fisheries

- **Vessels licensed**

About 23 mid-water trawlers in the 62-120 m length range are licensed to fish for horse mackerel (*Trachurus capensis*). This sub-sector has the largest number of 12-15 foreign flag vessels operating at any one time. However of these, at

least eight are wholly-owned by Namibian nationals, but retain foreign flag in order to facilitate work permits for the largely eastern-bloc crews (MFMR, 2010).

- **State of the stock**

Namibian horse mackerel is mainly exported to African markets. It is exported to DRC, Mozambique and Angola that take up about 87% all together, about 10% is exported to countries like Ghana, Cameroon and Nigeria and the remainder is consumed locally (MFMR, 2010).

The 2011 prices differed due to the rule of supply and demand. An average price of transhipped horse mackerel in the African markets was around US\$1050/mt while over land it was N\$7940/mt. The average local price during 2010 was N\$1.50 less than the 2011 price, which was recorded at N\$7.5/kg. The increase in price was mainly attributed to bigger size of fish caught and stability in exchange rate that prevailed since the beginning of the 2011 fishing season.

The 2010 acoustic survey biomass was estimated at 1,207,000 tonnes. The annual average mid-water catch-per-unit effort (CPUE) has increased drastically from 18.8 tonnes/hour on average, recorded in 2009 to 30.1 tonnes/hour on average recorded in 2010 (MFMR, 2010).

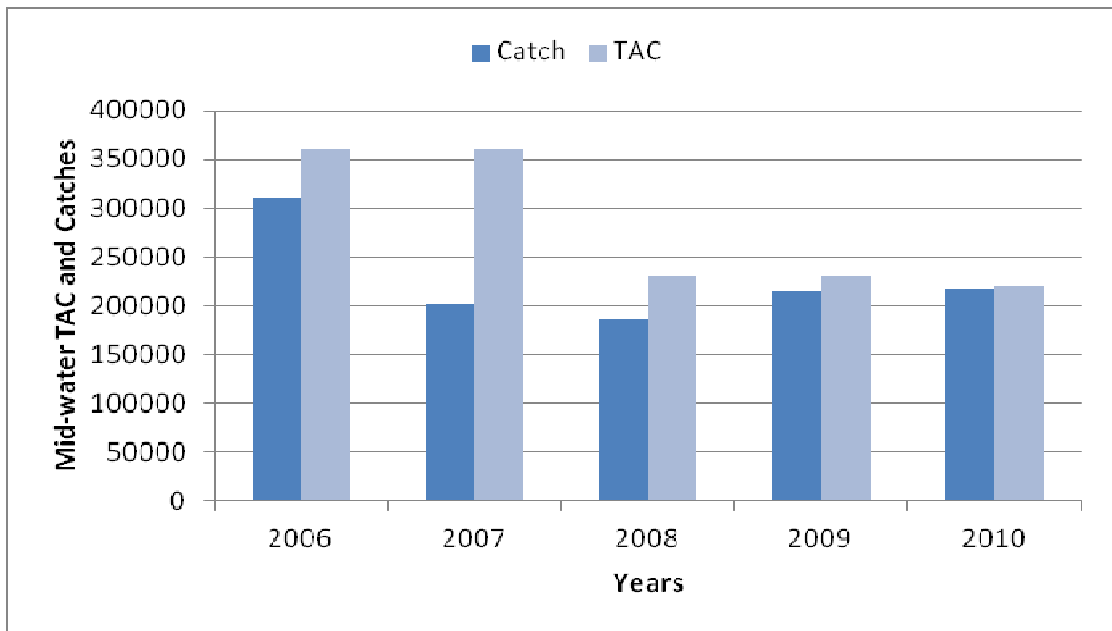
- **Number and duration of fishing rights**

No mid-water company has been allocated more than 20 years of fishing rights but they are granted rights of seven, 10 and 15 years to 28, 8 and 14 right

holders respectively. Those 42 rights, 22 are granted to horse mackerel right holders (MFMR, 2010).

- **Catches and Total Allowable Catches (TAC)**

Figure 3: Mid-water fishery’s annual TAC and total landings, 2006-2010



Source: MFMR, 2010.

Mid-waters are the highest of Namibian fisheries TAC with more than 250,000 metric tonnes granted during 2010 period. Of that, horse mackerel received 247,000 metric tonnes which were being processed both onshore and offshore (MFMR, 2010).

Mid-water fisheries have landed around 220000 metric tonnes during 2010 with horse mackerel recording an enormous of 217000. Mid-water fisheries were recorded under-caught during that period (MFMR, 2010).

- **Employment**

Mid-water fisheries have employed 1424 workers with 16 percent recruited only for horse mackerel fisheries (MFMR, 2010).

2.2.5.3 Pelagic fisheries

- **Vessels licensed**

A fleet of 62 targeted both small and large pelagic during 2010/11, which operated in Namibian coast. Out of those, 40 are for large pelagic, 14 line fish and eight small pelagic (MFMR, 2010).

- **State of the stock**

The major export destination for Namibian pilchard is South Africa to which 80-85% of canned pilchard is sent annually. Namibian pilchard is also exported to Thailand in the form of frozen cutlets. There is a market for Namibian pilchard in the UK but this particular market has not been serviced for the past few years due to a shortage in pilchard volumes. The products exported are mainly canned pilchard in tomato and chilli sauce; fishmeal; fish oil and cutlets. Whilst markets to which the large

pelagic species (Sharks, Tuna and Swordfish) are exported include: Spain, Japan and the USA.

Fresh and frozen (up to -24°C) are exported to Europe while those frozen up to -60°C for sashimi purposes are exported to Japan. Prices for large pelagic species were quite volatile, during 2011. Tuna was sold at N\$29.70/kg compared to N\$38.37/kg in 2010, other species prices were swordfish N\$66/kg, blue shark N\$13.2/kg, mako shark N\$27.5/kg and big eye for sashimi N\$33.75/kg (MFMR, 2010).

The biological indicators such as length at maturity show that the northern Benguela sardine stock is still in a stressed, low biomass condition. One positive sign was that of relatively good recruitment (high numbers of the 2009/10 cohort) encountered during the state-of-the-art sardine survey in October 2010, but about half of the sardine recruits were found in Angola.

The relative biomass estimates from the acoustic surveys decreased by almost 40% from around 357 000 (2009) to around 134 000 tonnes (2010). At such low biomasses the estimates show increased variability due to high mortality, fish avoidance or availability and so forth, or a combination of these factors. Since the surveys determined two successive years of above average recruitment, the stock assessment model estimated the current biomass to be higher than the survey did (SSB = 280 000 tonnes). Nonetheless, the spawning stock biomass is still below the

Limit Reference Point that needs to be reached and exceeded to ensure sustainable harvesting and better socio-economic returns of the sardine resource (MFMR, 2010).

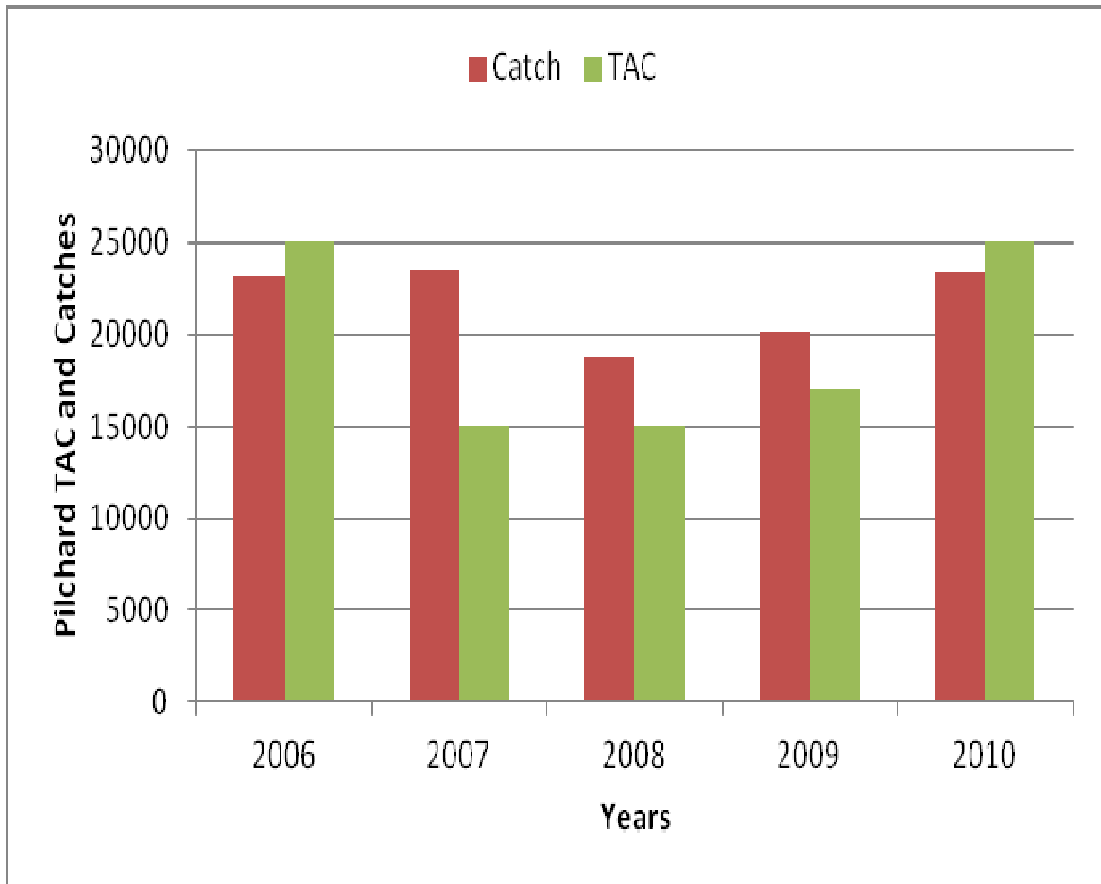
As snoek is a highly migratory, seasonal species, an annual TAC allocated to the lineboats fleet, which target this species, does not manage it. The lineboats fleets harvest what they need annually. Freezer lineboats produce high-value fresh/frozen snoek as well as low-value vlekkeed and salted snoek. Snoek is caught relatively close to Walvis Bay. For 2010 a total of 1518.8 tonnes of snoek were caught by the industry, almost double the tonnage 827 tonnes in 2009 (Landing data provided by the companies) (MFMR, 2010).

- **Number and duration of fishing rights**

Pelagic fisheries are not allocated rights for 20-years; they are granted seven, 10 and 15 rights to 10, four and 28 right holders respectively. Of those, 22 rights are granted to small pelagic (MFMR, 2010).

- **Catches and Total Allowable Catches (TAC)**

Figure 4: Pilchard annual TAC and total landings, 2006 - 2010



Source: MFMR, 2010

Pelagic are allocated approximately 27000 metric tonnes with 93 percent granted entirely for small pelagic (MFMR, 2010).

More than 20 000 metric tonnes have been landed during the period under review but small pelagic have been over-caught between 2007 and 2009. The over-catching has been attributed to the pilchard purse seines (MFMR, 2010).

- **Employment**

Pelagic fisheries have employed around 2349 employees with 58 percent recruited in the fish processing companies for small pelagic fisheries (MFMR, 2010).

2.2.6 Revenue generated

In 2010, the revenue collected increased by 18.4% from N\$96 029 in 2009 to N\$113 782. Furthermore, an increase in revenue collected has continued on an upward trend, and increased by 25.2% in 2011 compared to the collection of 2010. This increase of revenue collected is attributed to the outstanding quota fees mainly in hake fishery after the MFMR put in place stern measures for the fishing industry to settle their outstanding quota fees. The reduction in revenue collected in 2008 and 2009 could be attributed to the global economic crises *ceteris paribus* (MFMR, 2010).

Table 1: State Revenue from the marine fishing industry, 2006-2010 (N\$ thousands, current value)

Fees	2006	2007	2008	2009	2010	2011
Quota fees	68,299	107,218	59,255	68,800	78,500	120 947
Marine Resources Fund levy	12,446	12,561	12,075	18,733	19,228	14,497
By-catch fees	11,199	9,639	10,837	8,410	15,972	6,964
License fees	93	91	85	86	82	79

Total revenue	92,037	129,509	82,253	96,029	113,782	142,487
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Source: MFMR, 2010

2.2.6.1 Landed Value

This is the value of the fish in the form it is landed for instances at an X vessel prices. Landed value reduced by 26% between the years 2009 and 2010 from N\$5,087.4 million to N\$3,749.4 million respectively (MFMR, 2010).

The reduction in the landed and export values can be attributed to the negative effect of the economic crisis in the major markets that led to reduced prices of some fish and fish products. Low landings by about 10% could also be the reason for the significant reduction.

2.2.6.2 Final value

This is the value of fishery products in their final form at export (ex factory) prices. As it is shown in table 1 below, final value is higher than landed value. The difference is accredited to value addition by onshore fish processing. During 2009, final value was N\$4,789.3 million which, reduced by 15% to N\$4,059.8 million in 2010 because of reduced prices of most products and landings accordingly (MFMR, 2010).

2.2.6.3 Export value

This indicator gives the Namibian dollar parity of foreign currency earnings brought into Namibia due to the sale of fish and fishery products. Namibia's fishing industry remains the country's second biggest export earner of foreign currency after mining. Export value reduced by 15% between 2009 and 2010 from N\$4,637.3 million to N\$3,926.8 million respectively (MFMR, 2010).

Table 2: Fisheries Economic and Production Indicators, 2006-2010

	2006	2007	2008	2009	2010
Value of Production (N\$ in millions)					
Landed value	3,146	3,772	4,290.4	5,087.4	3,749.4
Final Value	3,985	4,843	5,084.1	4,789.3	4,059.8
Value of Exports (N\$ in millions)					
Fish Products	3,883	4,711	4,934.5	4,637.3	3,926.8
% of Total Export	19	17	14	15	13

Source: MFMR 2010

2.2.7 Contributions to the Gross Domestic Product (GDP)

The level of output in the fishing sector can be assessed by looking at its contribution to GDP. Over the past several years, the fishery sector has positioned itself as one of the major contributors to GDP. The sector's contribution to GDP is

essentially the gross income earned, wages and salaries, gross profits and indirect revenues from fish production. It does not include the value of intermediary inputs and it is therefore much less than the value of production.

Table 3 below shows the estimates of the contribution of the fishing sector to GDP at current prices, from processing on-shore and fishing and fish processing onboard. The revised figures were estimated using rebased prices of 2004 from the previously used base year of 1995. The fishery sector contributed 4.6% in 2009, compared to 3.7% contributed in 2010, representing a 20% reduction (MFMR, 2010).

Table 3: Contribution of the fishing industry to GDP (current values in \$ millions)

GDP Contribution	2006	2007	2008	2009	2010
Fishing	1,948	2,330	2,411	2,523	2,177
Fish processing	657	903	993	950	785
Total contribution	2,605	3,232	3,404	3,473	2,962
Percentage of GDP	4.8	5.3	4.7	4.6	3.7

Source: MFMR, 2010

The high costs of fishing had a negative effect on the fishing companies as they had to dig deeper into their pockets. The price of fuel hit a record level of U\$140 per barrel in June 2008 from a 2007 average of U\$72.32 per barrel. The

favourable exchange rate against the American dollar (US\$) and the euro (€) during the last two quarters of 2008, saw Namibia earn foreign gains from its fish and fish products. Generally speaking, prices for 2008 have shown an improvement although reductions were noticed in some fisheries i.e. a reduction was observed in tuna pole and long line prices (MFMR, 2010).

2.3 Best practice for fisheries management

Introduction

Norway has established three zones of 200 nautical miles: an exclusive economic zone around the Norwegian mainland (the Norwegian Exclusive Economic Zone), a fishery protection zone around Svalbard and a fishery zone around Jan Mayen. Within the exclusive economic zone, the coastal state does not have sovereignty, but sovereign rights over the natural resources both in and on the seabed and in the ocean areas above. This means that the coastal state has the sovereign right to exploit, preserve and manage resources such as oil, gas and fish (The Norwegian Ministry of Fisheries and Coastal Affairs [MFCA], 2013).

A coastal state's exclusive economic zone is a special maritime zone that is outside but contiguous with its territorial sea. The EEZ is not, therefore, part of the state's territory and subject to its sovereignty, unlike the territorial sea, which is an ocean area contiguous with its land territory and internal waters. The legal regime for the exclusive economic zone is enshrined in the UN Law of the Sea Convention of 10 December 1982. The zone can extend up to 200 nautical miles from the baseline on

which the territorial sea is measured, unless it collides with another state's jurisdiction (MFCA, 2013).

Besides that, Norway can also be rated as best practice to Namibia due to the following reasons:

- Norway has been very instrumental in assisting Namibia to set up its fisheries management successfully right after independence;
- Most Namibian students underwent and still pursuing their fisheries studies in Norway as a joint agreement between the two countries;
- FIMS had been developed and stored by Norwegians; and
- Norwegians have conducted numerous studies to establish the best approach for Namibian Marine Fisheries Management.

2.3.1 Resource advisory service

The fundamental principle for the Norwegian management of living marine resources is the principle of sustainable use based on the best available scientific advice. The term sustainable is generally defined as “a use or development that meets the needs of the present without thereby compromising the ability of future generations to meet their own needs”. In fisheries management, this can be interpreted as continuous harvesting of viable stocks (MFCA, 2013).

The management of the fish stocks requires knowledge of their size and other characteristics, but also knowledge of the ecosystems of which the stocks are a part.

2.3.2 Resource monitoring

Each year, the abundance of several marine resources is mapped in scientific surveys, using echo sounders, trawling, abundance estimations of eggs and larvae, tagging, or just counting along transects when whales are estimated. The surveys are often joint investigations with participation from many countries, such as for instance the International Bottom Fish Surveys (IBTS) in the North Sea. The data from each vessel participating in the survey is combined to make a total estimate of a particular species in a specific area (MFCA, 2013).

In Norway, the Institute of Marine Research is responsible for monitoring the fish stocks and the other living marine resources in Norwegian and adjacent waters. From about 80 species exploited in Norwegian fisheries, scientific advice on approximately 20 species based on systematic stock monitoring, while advice on further 20 species is based on catch data. Many of the species have little commercial significance, but may none the less be important in the food chain and the ecosystem (MFCA, 2013).

2.3.3 Stock assessment

In fish stock assessments, scientists combine data from these scientific surveys with available information from fisheries, catch statistics, and information on the state of the ecosystem, including food supplies for the individual species.

For most stocks of interest to Norway, assessments are made jointly with scientists from several countries under the aegis of the International Council for the Exploration of the Sea (ICES). Scientists from the ICES member countries work together on the collected stock data in annual working groups. The calculation tools are mathematical models, the choice of model depending on the characteristics of the stock and what data is available. The Norwegian input to these models is generally based on both catch and cruise data (MFCA, 2013).

2.3.4 Multi-stock models

Most of the mathematical models that have been used up to now are based on individual stocks, because this has proven to be an operational way of creating a basis for advice on harvesting quotas. However, many factors affect fish stocks, one being the availability and quantity of food on the various links of the food chain. Several species appear to be more closely linked than others. For example, there is a close interplay in the Barents Sea between cod, capelin and herring. To be able to take into account as many as possible of the factors that may affect the individual stock, multi-stock models are being developed. Such models have now been adopted for the assessment of individual stocks where the link to and dependence on other stocks seems clear (MFCA, 2013).

2.3.5 Advice on fishing quotas

The ICES Advisory Committee for Fishery Management (ACOM) uses the results from the stock assessment working groups to formulate advice for the management of marine resources. An important element in the advice is the notion of Total Allowable Catch (TAC) of a given stock (MFCA, 2013).

The report from ACOM is sent to member states, EU and fishery commissions, which are regional bodies for the management of marine resources in specific areas. Even if total quotas are subject to political influence, they are based on data from the national research institutions. Through ICES, this information is used as a basis for impartial and non-political advice (MFCA, 2013).

Table 4: Norwegian types of quota allocations

Individual Vessel Quota (IVQ)	Quotas are fixed for each participating vessel holding a license or annual permit, which guarantees them a fixed proportion of the group quota. IVQs mainly apply to vessels with permits or licences.
Maximum Quota	Allocated to coastal vessels in open access fisheries, also called Olympic quota. Once the group quota has been reached, fishing is stopped, regardless of whether each vessel has reached its Maximum Quota. This system is used in groups where the efficiency of vessels varies widely and includes many small vessels.
Groundfish quota	Mainly regulate coastal vessels using conventional gear, rather than trawlers. Quota combining the quotas from cod, haddock and saithe

	from each vessel participating.
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Source: MFCA, 2013

Development of ICES stock advices takes place in several stages as:

- scientists in the various countries obtain basic data from fish landings, discards and scientific surveys;
- The information used in the ICES working groups to assess the status of the stocks; and
- the results from the working groups reviewed by ACOM, which decides what the ICES official advice on the management of the stocks is to be.

Sustainability is the basic principle of any management strategy. Optimal resource utilisation and predictability for the fishing fleet are other criteria that are reasonable to include. In order to evaluate the degree of exploitation and also the condition of the stocks in relation to such criteria, biological reference-points have been developed.

In most complete enumeration approaches, fisheries staffs do not directly undertake data collection, but use external sources. Most commonly, these sources are data forms completed by the fishing companies themselves.

Fishing companies are often a good source of information regarding basic data on catches and fishing effort. Regular submission of basic data is a part of the

fishing licensing process. Data submitted by companies is often in the form of logbooks or landings declarations. Logbooks should contain detailed information on individual fishing operations, including fishing grounds, type and duration of operation, catch by species and other types of data relating to weather and sea conditions. Landings declarations usually deal with grouped data presented as summaries of fishing trips and catch by species.

2.3.6 Policies that regulate the fishing industry in Norway

Norway has around two square kilometers of sea under its jurisdiction. A 200 nautical mile economic zone was established in 1977 and Norway ratified the UN Agreement on Straddling Fish Stocks and Migrating Fish Stocks and the UN Convention on the Law of the Sea in 1996 (FAO, 2013).

The Norwegian Ministry of Fisheries and Coastal Affairs is responsible for the fisheries and aquaculture industry and ports and sea transport infrastructure. Important areas of activity for the Ministry of Fisheries and Coastal Affairs are:

- Conservation and long-term optimum sustainable utilisation of living marine resources;
- Responsible management of the marine environment; and
- Contributing towards a profitable, self-sustained fisheries industry

The main legislation for the management of the fisheries is the Act relating to the Regulation of the Participation in Fisheries and the Act relating to the management of wild living marine resources. Fish stock rebuilding takes primarily place under the Act relating to the Management of wild living marine resources. However, in special cases with a threatened and endangered marine species, this species can be prioritized according to the Nature Diversity Act. Then this Act sets out requirements to protect and implement recovery strategies for the species. The purpose of the Act relating to the management of wild living marine resources is among others to ensure sustainable and economically profitable management of wild living marine resources and genetic material derived from them. The Act also states that special importance shall be given to among others a precautionary approach in accordance with international agreements and guidelines, and an ecosystem approach that takes into account habitats and biodiversity, when managing living marine resources (MFCA, 2013).

The Act also introduces a new principle (principle for sustainable management) in the legislation relating to living marine resources in Norway. Section 7, paragraph 1 of the Act thus states that “The Ministry shall evaluate which types of management measures are necessary to ensure sustainable management of wild living marine resources”. The Act puts an obligation on the Ministry to evaluate the living marine resources on a regular basis and to adopt relevant management measures (MFCA, 2013).

The purpose of the Act relating to the regulation of the participation in fisheries is to adjust the fleet capacity to the resource basis, to ensure a sustainable utilization of the marine resources and to increase the profitability and wealth creation in coastal communities. The administrative measures applied to limit fishing effort in the Norwegian fisheries are licences and annual permits combined with Individual Vessel Quotas (IVQ) founded in both the above Acts. Today, all commercial fishing by trawlers and purse seiners requires a licence. Long-liners and coastal vessels are regulated through annual permits. Only fishermen are permitted to own fishing vessels in Norway, but dispensations have been granted to allow some industrial corporations to vertically integrate into the catch sector (MFCA, 2013).

Thus, one set of regulations limits access to fisheries. Limitations on access to fisheries are critical to conservation as well as to the economy of the fleet. A second set of regulatory instruments is the quota regulations that specify how much a fishing vessel may catch. The quota regulations provide the actual fishing opportunities for a fishing vessel. A fishing vessel may hold a number of licenses and quotas, which provides its fishing opportunities. National quota regulations are established each year for cod, haddock, saithe, herring, mackerel and some other species (MFCA, 2013).

The third set of regulatory instruments consists of technical regulations that restricts when, where and how fishing may occur. Such regulations are critical to conservation, and include prohibitions on discards of fish as well as flexible protected

areas that can be closed for fisheries when undersize fish, or species for which quotas are exhausted, prevail in catches (MFCA, 2013).

For purpose of prudent fisheries management and control, Norway has established an extensive system to regulate the fishing activities and their fleet. There are three corner pillars in the control and enforcement system in Norway: the Coast Guard, the Directorate of Fisheries and the Sales Organizations (MFCA, 2013).

2.4 Policy or Legal Framework in the Namibian fishing sector

Policies and legislation adopted by government after independence must be seen in the context of the Namibian Constitution, which states that:

“The state shall actively promote and maintain the welfare of the people by adopting, inter-alia, policies aimed at the following:

... j) consistent planning to raise and maintain an acceptable level of nutrition and standard of living of the Namibia people and to improve public health;

... l) maintenance of ecosystems, essential ecological processes and biological diversity are maintained and living natural resources are utilised on a sustainable basis for the benefit of Namibians, both present and future” (Article 95 – Promotion of the Welfare of the People).

“Land, water and natural resources below and above the surface of the land and in the continental shelf and within the territorial waters and the exclusive economic zone of

Namibia shall belong to the state if they are otherwise lawfully owned” (Article 100 - Sovereign Ownership of Natural Resources) (The Namibian Constitution, 1990).

2.4.1 The 1991 White Paper “Towards Responsible Development of the Fisheries Sector”

In terms of policy formulation relevant to fisheries management in Namibia, the Ministry of Fisheries and Marine Resources soon after independence issued the 1991 White Paper “Towards Responsible Development of the Fisheries Sector” (MFMR, 2004).

It had two main objectives to:

- 1) Prevent depletion of species and rebuild stocks decimated during the colonial period and
- 2) Maximize benefits for Namibians, both the harvesting of fish and in the processing industry. This policy is currently under review and has been renamed “Towards Responsible Development and Management of the Marine Resources Sector”.

In this policy, the mission of the Ministry is to strengthen Namibia’s position as a leading fishing nation and contribute towards the achievement of the country’s economic, social and conservation goals for the benefit of all Namibians. To achieve this mission the ministry has several specific objectives.

These are as follows:

- Promote and regulate the optimal sustainable utilization of living marine resources within the context of conserving marine ecosystems;

- Establish a conducive environment in which the fishing industry can prosper and derive optimal income from marine resources;
- Further Namibia's interest within the international fishing community;
- Provide professional, responsive and customer-focused services;
- Continuous investing in human resources development;
- Establish a conducive environment for the conservation, utilization and management of living marine resources and fresh water fish resources; and
- Develop a conducive environment for the responsible and sustainable development of aquaculture.

2.4.2 Marine Resource Act (MRA) No. 27 of 2000 and the regulations relating to the exploitation of Marine Resources (2001)

This Act was enacted by Parliament in 2000 and enforced on August 1, 2001. The Act replaced the Sea Fisheries Act of 1992, and deals with the harvesting and commercial exploitation of marine fisheries resources. The Regulations Relating to the Exploitation of Marine Resources (2001) promulgated under this act replaced the Sea Regulations of 1993. One vital feature under this piece of legislation was the establishment of a permit system for recreational fishing as a measure to protect and conserve coastal fish species.

These laws identify only two types of fishing: commercial and recreational. However in terms of the definitions “, ‘recreational purposes’ means for the purpose of

sport, leisure or subsistence” (MFMR, 2001 – Regulations Relating to the Exploitation of Marine Resources, Part I - Definitions) (MFMR, 2004).

Commercial fishing includes all fishing activities from which the catches may be sold, and which require a right or exploratory right, and may be subject to restrictions on quotas, gear, methods, season and so on.

In the MRA harvesting of marine resources for ‘commercial purposes’ includes amongst others, “the intention of selling, bartering, pledging or otherwise disposing of, or delivering or offering to do any of these things mentioned in this paragraph in respect of such resources” and “exceeding the limits prescribed for the harvesting of marine resources for own use” (MRA, 1992 – Part I, Definitions) (MFMR, 2004).

The Minister of Fisheries and Marine Resources issues the commercial fishing rights almost exclusively to Namibian companies. Applications are screened by a high level committee within the Ministry which considers, inter alia, the shareholding of the company, its record in the fishery if any, projected employment and other economic benefits. Only right-holders are entitled to participate in a fishery, and in the major fisheries are allocated a proportion of the Total Allowable Catch.

There are nominal application and vessel licensing fees, but charges are mainly levied on the catch with fixed fees per tonne. Depending on the fishery, these

may include a quota levy, a by-catch levy, an observer fund levy and a scientific research levy. The resources targeted by the fishers whose activities could be described as artisanal, are subject to some of the lowest levies in Namibia, with U\$25 per tonne payable on linefish landings and U\$2.50 per tonne for mullet (MFMR, 2010).

Recreational fishing permits are issued to any applicant- irrespective of residence or nationality - on production of an identity document and payment of a fee of N\$14 for a one-month license or N\$168 for a year. Licenses can be obtained at MFMR offices in Luderitz, Walvis Bay, Swakopmund, Henties Bay and Windhoek. There is no limit on the number of licenses issued (MFMR, 2010).

2.4.3 Aquaculture Policy 2001

The Government of Namibia views aquaculture development as a priority area. The current policy of this developing sector is laid down out in the policy paper “Towards the responsible Development of Aquaculture (2001) MFMR, 2010).

Marine species like shellfish and finfish and fresh water species like Tilapia (*Oreochromis andersonii*) and catfish (*Clarias gariepinus*) were identified as having potential for aquaculture. Fresh water aquaculture pilot studies are underway in the northern region (Kavango, Caprivi and Omusati) and Hardap region. The main policy objective is the responsible and sustainable development of aquaculture to achieve socio-economic benefits for all Namibians whilst ensuring environmental stability.

The Government foresees that the role of aquaculture is to enhance food security, reduce poverty, create employment, improve rural livelihoods and increase investment. Specific objectives of aquaculture are to promote aquaculture activities in and around the productive unpolluted and nutrient-rich waters off the coast of Namibia and the four perennial rivers that border Namibia.

2.4.4 Namibianisation

The Namibianisation of the fishing industry intended to benefit those Namibians who had ‘been socially, economically or educationally disadvantaged by discriminatory laws or practices’ in the past. To achieve this, the government used the granting of rights of exploitation and the allocation of quotas to Namibian operators (MFMR, 2010).

By 1994 it is claimed that 70% of right holders were ‘wholly owned Namibian businesses’ and ‘23% were majority Namibian owned’. The 1991 White Paper “Towards Responsible Development of the Fisheries Sector” can thus be seen as part of the Namibianisation of the fishing industry, in promoting employment of Namibians in fishing and processing as well as in associated support and service industries (e.g. boat building, gear production and repairs, can making, distribution and marketing) and in also seeking to export value added products (Elago, 2004).

According to Elago (2004) the declaration of an EEZ and thus of vastly expanded fishing grounds also provided the opportunity for the Namibian government

to use fisheries for redistributive purposes to address the large socio-economic inequities inherited from apartheid-rule. This would allow government to use the developmental potential of fisheries to give impetus to other government policies in which poverty alleviation was identified as a national objective.

The government policy on investment (e.g. reduction of non-mining corporate tax rates to 35% and of non-resident shareholder tax to 10%; exemptions from exchange controls to enable repatriation of profits and capital) can also be seen as a measure that, by attempting to attract foreign direct investment through a range of incentives, tried to encourage manufacturing, exporting and job creation in different industries in Namibia, including the fishing industry (Elago, 2004).

In assessing the outcome of the new fisheries policy in Namibia, Elago (2004) has reservations regarding its success with respect to the socio-economic benefits accrued to those Namibians who were mostly disadvantaged in the past. Namibia has done extremely well in managing the fisheries sector since independence and that the Government deserves the considerable praise that it has received for its stewardship of Namibia's marine fisheries. However, he also expresses concern that those who have benefitted are the wealthier and educated Namibians, with few benefits accruing to the most marginalized. He argues that while the poor would not have had the capacity to harvest marine resources, the Namibianisation of the fisheries should have ensured that part of the benefits, were directed to the poorest.

After independence, the government was collecting more than 50% of available rent, but that dropped to 26% in 1997 and 11% in 1998, resulting in N\$723 million in uncollected rent. This has been accruing to the private sector, not only to Namibians who have joined the fisheries industry since independence, but to large (Namibian and foreign) conglomerates (MFMR, 2004a).

3 Chapter 3: MATERIALS AND METHODS

The Delphi methodology was selected as the most appropriate means to achieve the goals and objectives of this research because it provides a way to solicit and gain consensus by experts on the Namibian fisheries data collection and management.

This is a Delphic study, which sources most of its information or findings from different stakeholders of the MFMR. During this study period, roughly 15 fishing companies dealing with major fisheries as hake, horse mackerel, sole, monk, line fish, pelagic and the Directorate of Operations of MFMR in Walvis Bay were visited and staff interviewed between 24 February 2013 and 1 March 2013. Similar approach was also conducted with the Directorate of Operations of MFMR in Luderitz between 24 and 28 March 2013.

The personal interviews were held with both the regional Fishing companies and the MFMR Directorate of Operation based at coastal areas in Walvis Bay and Luderitz, which are situated roughly 300 and 700 Km's respectively away from Windhoek-Head Office.

Walvis Bay:

- Day 1 (25/02/2012): Tunacor, Freddie and Gendor fishing Companies;

- Day 2 (26/02/2013): Benguella, Abroma, Cadilu Fishing Companies and MFMR Walvis Bay staff members responsible for fisheries data collection and capturing of fisheries' tallies;
- Day 3 (27/02/2013): Gendev, Pereira, Cato (Overberg) and Talanam Fishing Companies;
- Day 4 (28/02/2013): Hangana, Westhoo, Seawork, Merlus Fishing Companies and the Harbour; and
- Day 5 (01/03/2013): United Fishing Enterprises and meeting with the Head of Fisheries Operation Division in Walvis Bay.

Luderitz:

- 24 – 28 March 2013: Met with the MFMR staff for the Directorate of Operation and responsible for fisheries data collection and capturing of fisheries' tallies. Subsequently, responsible for sending monthly returns to Windhoek. Only the MFMR staffs were interviewed and not fishing companies from Luderitz as their mother companies are in Walvis Bay.

The processes involved:

- A personal interviews with participants from the MFMR staff both Windhoek and coastal areas as well as from fishing industry who were selected because of their expertise and/or specialization in fisheries data collection and management;

- Information collected from published and unpublished documents within the MFMR and the NatMIRC library related to Namibian commercial fisheries data collected during 2006 to 2010; and
- Analysed the FIMS that store and manage the fisheries landings data and identifying possible challenges or gaps between the fishing companies and the MFMR that hinder the process of landings data flow.
- Feedback in the form of written thesis would be communicated back to all participants in order to see how the gaps could be rectified.

Figure 5: Visiting to the Namibian fishing companies and processing factories



Photo: TP Uahengo

Figure 6: Fish landed off the Namibian ports



Photo: TP Uahengo

4 CHAPTER 4: STUDY FINDINGS

This chapter presents Strengths, Weaknesses, Opportunities and Threats (SWOT) and their analysis for a fisheries information management system. Second, the main findings for addressing the weaknesses, mitigating the threats and taking advantage of opportunities are expounded.

4.1 Strengths

There are significant strengths in fisheries data collection and management, especially the policies, manpower and FIMS. The culture of fisheries data collection has been and continues to be a norm for the benefit of past, present and future Namibians.

4.1.1 Commitment to managing for development results

Strength of FIMS derives from enormous statistical awareness and value attachment among fisheries managers and the great demand for evidence-based policy implementation. From this management drive, stems management support for improvement programs. There is consistent appeal of data to scientific recommendations and the quest for timely monitoring of the performance of the quota system.

4.1.2 Advances in Information Technology (IT) Division of the MFMR

The MFMR has made significant advances in the IT Division such as infrastructure which including the wide area network, local area network, Internet and intranet connectivity amongst the most efficient in relation to other government institutions.

Applications of the IT Division in statistical work must strengthen work processes to speed up data collection and processing and subsequently standardize work processes.

4.2 Weaknesses

There are several weaknesses in Namibian fisheries data collection and management. Most important among these weaknesses are the low interest of stakeholders in data collection and management processes. Second, FIMS is also not user-friendly as it is not compatible to Microsoft spreadsheets or access and thus made the system difficult for availability of timely and high-quality fisheries data.

4.2.1 Working arrangements and institutional development

The absences of coordinated working arrangements and the absence of work procedures in the flow of information are found to be the most limiting factors to information management. Effective fisheries management must have well-established formal and institutionalized arrangements and protocols for intra-coordination and collaboration among key data producing divisions and inter-coordination and collaboration between data producing divisions and end-users.

Coordination, collaboration, networking and information sharing in the fisheries information management are essential for:

- i. Preventing of duplication of effort which often leads to inconsistent data and wasteful utilization of resources,
- ii. Avoiding concentration of interdependent work on fewer functional divisions as a result of some divisions overlooking their responsibilities,
- iii. Achieving synergy and cost-effectiveness in utilization of resources,
- iv. Avoiding non-complementary work and rivalry, and
- v. Generally providing better statistical information.

The study established that horizontal collaboration among data producing divisions in the MFMR is generally weak. Arrangements for coordination must be established between staff from the Directorate of Operations, the Statistics Division of PPE and the Research Management Division of the Directorate of Resource Management.

Greater collaboration between data-producing divisions and end-users must be re-kindled. This form of coordination aims to mainstream end-users in the system so that they can play proactive and upstream roles in the data development. In order to ensure that data needs for end-users are continuously assessed and synthesized, it is important that mechanisms are established for continuous dialogue between data producing divisions and end-users.

The study also found that the need for effective arrangements for collaboration with the data suppliers, in this case, the fishing industry. Data suppliers are under statutory obligation to provide needed data. Due to the increased trend of non-response to statistical enquiries and data collection activities, the lack of feedback mechanism, a lasting formal relationship between the MFMR and fishing industry will go a long way in promoting a smart statistical partnership.

These levels of coordination must lead to data producing divisions to cease the negative attitudes of not wanting to share information or knowledge with others (“silo mentality”) in the production of data.

The study shows that the flow of data from inspectorates to researchers and the Statistics division of the PPE in Windhoek are uncoordinated and not properly monitored, which simplify the possibility of omission, untimely submission and submission of non-validated data.

Information sharing in the FIMS is not satisfactory and factors limiting information sharing include things as “silo mentality”, data sometimes not submitted or properly processed, full documentation may be missing and a proliferation of individual databases, which limit access to such data when needed by others.

4.2.2 Access and functionality of FIMS Database

FIMS Database, apparently since its onset in 2008, has largely been underutilized but also not fully functional. Traces of underutilization, both by data processing divisions and end-users still linger on.

The study established that:

- The FIMS Database is largely not user-friendly and this aspect scares off potential users. Its designers have a number of preconditions which define a sequence of activities that must be performed by the same office and due to the lack of well-monitored procedures and system or mechanical failures; there is no guarantee that all conditioned activities would be performed by responsible divisions. To the extent that if these dependent activities are not performed in a timely fashion, or not performed, all other subsequent tasks get affected.

Another disadvantage of dependent datasets is their susceptibility that negatively impacts on end-users. Sometimes programming errors and faulty information retrieval rules hinder FIMS database usability. For instance, a programming error in the functioning of a trip data entered in the database makes some of these records

unrecognized. As the FIMS database prevents users from entering landings data without fishing trips records, entry of substantial data is barred, resulting in alternative arrangements to capture and store data.

Numerous statistical reports of FIMS give different totals of summary statistics, which complicates tabulation of data by various dimensions. Some important reports such as Total Allowable Catches (TAC) versus Landings and hake wet/freezer reports do not fully function. These findings suggest that urgent repair work needs to be prioritized to justify the clarion call for universal FIMS use.

- The IT Division in collaboration with other sister divisions must mount a serious advocacy campaign to create a culture for FIMS usage. As stated above, this advocacy must at most be accompanied by redress of user training needs and repair of current bottlenecks in functionalities.

- There must be intense hands-on training for different categories of users.

4.2.3 Data quality, development and management for data flow

There is an apparent need to improve data quality in terms of timeliness, completeness, accuracy and consistency. The study noted that quality improvements, in its multifaceted dimensions, hinges on data collection and collation.

As most of the data processing is decentralized, management of the flow of information is an important determinant of data quality. It was also noted that there are no control measures to guide data flow and that manual reconciliation of landings data is the main problem that hinders timeliness of this information. The study recommends that a departure from manual recording to technological-based statistical reconciliation per offloading is the relevant information age approach to collect landings data. This approach represents a quantum leap towards achieving timeliness of landings data, , dispose of unnecessary duplication of effort and realize considerable savings on the time resources.

It was also noted that the technology required to bring about on-the-spot reconciliation is not costless. A feasibility study based on those factories, which have made advances in this regard, needs to be carried to establish industry view as well as cost implications. As monitoring of landings is an integral part of fisheries management, cost-recovery from the industry to finance management cost may be an important source of funding this operation. There may also be opportunity for donor assistance in this field.

The shift from manual recording of landings to the technology-led on-the-spot reconciliation requires the landings module of FIMS to be modified to allow the capture of reconciled data per landing date.

4.2.4 Organizational and human resources development

The effective functioning of fisheries information management requires the human resources harnessed to carry out the tasks of well-skilled and motivated data processing personnel, if the system is to produce quality outputs in a sustainable manner.

Fisheries information management is inundated with human resources problems including:

- **Shortage of qualified and skilled personnel to collect and validate data.**

Personnel, some of whom do not have adequate background in numeracy, do data collection and collation. The clerical staff and fisheries inspectors involved perform such tasks as collection and summarizing huge amounts of raw data. The data must be verified and validated, but this task is enormous in magnitude and technical detail for staff at non-professional level.

Obviously there is a need to employ statisticians to be responsible for data validation and contribute to data analysis.

- **Shortage of personnel for data processing.**

The data are not collected for filing. It must be processed in a timely fashion and made available to users. However, it is noted that substantial data lie unprocessed.

Luderitz Inspectorate, for example, employs only one clerk responsible for both punching of tallies and reconciliation with companies. There is thus a disproportionate concentration of work on one person. In fact, it is found that data quality will not significantly improve and sustain if the staffing situation is not improved. Additional staff is required, not only at clerical but at professional level, to diffuse the skills mismatch problem. There is thus the need to determine the critical mass of permanent statistical personnel needed to effectively carry out these functions.

- **Inadequate statistical training, staff motivation and retention.**

It is noted that there is no adequate training for statistical personnel. Whatever in-service training has taken place is limited and, at times, irrelevant. It was further noted that there is limited understanding of the value of statistical work amongst statistical personnel. This situation is exacerbated by an apparent heavy work-load and restrictive career path which generally lead to low motivation.

4.2.5 Institutional development

As noted above, shortage of qualified personnel limits the quality of the data output. Institutional arrangements and the absence of statisticians at regional centers are constraints that are not conducive to the emergence of an efficient data quality control system for the MFMR.

4.3 Opportunities

The MFMR is currently busy restructuring the entire Directorate of PPE, which will now allow the Division of Statistics to expand and allocate staff in the regional areas for statistical data collection purposes. This process would, for the first time, opportune the Statistic Division to collect data for aquaculture and inland fisheries.

4.3.1 MFMR commitments to develop and improve data

There is a demonstrable commitment to develop data for management purposes. With the realization that “if you cannot measure it, then you can’t manage it”, there is unwavering commitment to results-based management and evidence-based policies amongst the MFMR’s management cadre. This is demonstrated by consistent appeal to statistical information in management decisions. In fact, demand for statistics far outstrips current supply. Deriving from this tradition, it is reasonable to anticipate management support of strategic activities envisaged in this study.

4.3.2 Real-time statistical reconciliation

There is a real opportunity to realize on-the-spot reconciliation and achieve the strategic objective of data availability no more than a month after data collection. Already, landing sites which support automated systems generate summary landings promptly after offloading, which enables on-the-spot reconciliation. With the help of cost-recovery from the fishing industry, there is opportunity to fund the technology required to achieve this result. There is also the opportunity

for the donor community to aid the MFMR in acquiring and developing applications for hand-held devices to facilitate the validation of data thus reconciled.

4.3.3 Staffing, Institutional development and training

Structural shortcomings regarding statistical personnel on the establishment of the Directorate of PPE, Operations and Resource Management represent opportunity for improvement. Permanent data processors are needed for the Directorate of Resource Management in so far as centralized and accessible research data is important to other users. The Luderitz Inspectorates need clerical staff and equipment. Space for the establishment of data processing centres at National Marine Information and Research Centre (NATMIRC) and Inspectorates exist for the establishment of these centres. In-house, hands-on training opportunities outside the MFMR must be sought.

New Statisticians, as per new restructuring process, would be deployed at aquaculture and inland fisheries centers countrywide for data collection and processing them to Head Office for capturing, analyzing and dissemination.

4.4 Threats

There are also some threats, which need to be tackled so that the fisheries data collection and management would not be restrained. An important threat would be the lack of

commitment or interest of stakeholders dealing with data producing, collection, processing and capturing.

Second, the statutory framework is an out dated legislation that does not spell out the punitive measures for non-compliance such as fishing companies that do not provide their monthly landings returns on time.

Possible risks to the improvement of data management include, among others:

4.4.1 Lack of commitment to coordination, collaboration, networking and information sharing

The overall performance of the system significantly depends on the commitment and motivation of statistical personnel. There is a need to create an understanding of why statistical work is important and a sense of strategy ownership among staff. By and large, balanced restructuring is needed so that staff is not overloaded.

The mitigating measures against these risks include the implementation of the control programmes and interaction with end-users.

4.4.2 Lack of trained IT Division staff and inadequate IT Division support services

The scarcity of skilled IT Division personnel poses considerable threat to diminish FIMS database use. The provision of adequate IT Division support services is critical in inducing sustainable use of FIMS.

To the extent that FIMS database related problems are not attended to on time, users are crowded out of the system and find alternative ways to process data. This problem is made worse by system failures and lack of training. As FIMS database resource personnel are few, there is a time-lag in addressing problems reported by users. The threat for abandoning the FIMS database is therefore enormous to handicap the drive for universal FIMS usage.

Technical training for the IT Division staff as well as other users with potential must be pursued in the context of the existing Bull Information Technology Namibia (BITNAM) Agreement to mitigate against this threat.

4.4.3 Lack of supervision

Implementation of the recommendations and adherence to procedures will not be fully realized and sustained if supervision is faulty, particularly in the beginning of the programmes. Deliberate focus needs to be made on the functioning of the

programmes so that their functioning does not depend on individual staff members involved.

4.4.4 Staff turnover

Trained IT Division staffs, researchers and Statisticians are few. Due to flat structures and career paths in government, often staff members in the employ of the MFMR leave for other jobs.

Table 5. SWOT analysis for study's findings

STRENGTHS	WEAKNESSES
<ol style="list-style-type: none"> 1. Existence of a comprehensive official information management system (FIMS), 2. Existence of strong demand for information and management for results, 3. Existence of facilitating bodies such as the Information Steering Committee and MFMR-Fisheries Observer Agency (FOA) Committee, 4. Modern IT Division infrastructure (WAN, LAN, Intranet), and 5. Existence of competencies in a number of functional divisions in the MFMR to facilitate training. 	<ol style="list-style-type: none"> 1. Lack of coordination among data producing divisions, 2. Unsatisfactory communication and information flow, 3. Inadequate statistical personnel on the establishments in the Directorate of PPE, Directorate of Operations and Directorate of Resource Management, 4. Shortage of some critical skills in some data producing and management divisions, 5. Non-optimal utilization of FIMS, 6. Unsatisfactory data validation processes, 7. Lack of well-defined work procedures in some divisions, 8. Inadequate summary reports in

	<p>FIMS and non-functional reports,</p> <p>9. Inadequate of some statistical outputs and data dissemination,</p> <p>10. Data gaps and incomplete data,</p> <p>11. General lack of timeliness in data release, and</p> <p>12. Proliferation of incompatible databases.</p>
<p>OPPORTUNITIES</p>	<p>THREATS</p>
<p>1. The MFMR’s commitment to data development and information management,</p> <p>2. Shifting of statistical reconciliation to landing points,</p> <p>3. Possibilities for normalizing statistical personnel on the MFMR’s structure,</p> <p>4. Advances in the IT Division, and</p> <p>5. Possibilities for coordinating in-house, tailor-made training.</p>	<p>1. Lack of commitment to coordination, collaboration and information sharing,</p> <p>2. Lack of trained IT Division staff and inadequate IT Division support services,</p> <p>3. Disregard of FIMS, and</p> <p>4. Lack of relevant supervision</p>

5 Chapter 5: Discussions

To improve the current fisheries data collection and management, identified factors such as strategies to smoothen the data management; training or improvement on FIMS usage; proper fisheries data monitoring and management are required.

5.1 STRATEGIES FOR SMOOTH PROCESS

The study recognized the superiority of the strategic management approach to permit objective, logical and systematic implementation of the recommended activities and to enhance the performance of FIMS. These approaches believed to:

- Allow for prioritization, identification and exploitation of opportunities;
- Present a framework for improved coordination and control of activities;
- Facilitate better communication on data matters;
- Help integrate individual effort into total effort; and
- Encourage forward thinking and pro-action.

5.2 Strategic outcomes

Three main points have been identified for the realization of the role of the fisheries information management system:

5.2.1 User satisfaction

Meeting user needs is essential for the performance and sustainability of FIMS. There are merely two groups of users; namely FIMS database users in so far as they

process data into the database and end-users that require statistical products from the system. It is, therefore, important that one of the strategic outcomes must be satisfaction of:

- Database user training and access needs to be able to perform their tasks with confidence and make reference to other related information,
- Other end-users training and access needs to permit broad analyses, and
- Management information needs to support management for results and evidence-based decisions.

5.2.2 Effective processes

Another strategic outcome must be an effective process value chain that starts with innovation processes and ends with delivering quality value-added outputs in a timely manner.

5.2.3 Improved staffing

Staff is the most important resource in any system. Understaffing results in sub-optimal outcomes. Staff contribution to the success of the system must be scant if they are not satisfied, such as if climate is not conducive, motivating and skill developing. Structural balancing in terms of staffing and staff satisfaction are an important strategic outcome of the strategic goals envisaged in the study.

5.2.4 System access, functionality and user-friendliness

The study noted that the following strategic themes or overall accomplishments be achieved for proper fisheries information management:

- **FIMS Accessibility**

As noted earlier in this study, not all users of FIMS have all the relevant access rights. Granting access is not an end in itself because users need to know how to use the system. Not all static reports of FIMS function and for those that function, their coherence and user-friendliness are important.

To achieve this goal, a number of activities must have to be undertaken in a time-frame consistent with existing the BITNAM-MFMR Agreement, for those activities that require external expertise.

- **Granting of access rights**

The starting point is to categorize users and profile their information and training needs. This is an in-house arrangement. A related activity is to develop a training program tailored to user needs. As far as possible, training must be run by the MFMR's own resources persons from various data backgrounds. The associated output from these activities become apparent in the numbers of persons able to access and use FIMS with confidence and satisfaction.

- **Repair FIMS static reports**

The retrieval arguments for all Landings and Quota modules reports have to be examined and repaired. All landing reports give different summary totals and not all information feeds into reports. As users are interested in statistical outputs, the need for prioritization of this activity cannot be overemphasized. As reports structure and information retrieval require advanced programming skills, this task must require involvement of a BITNAM resource person.

An obvious performance indicator for this activity is significant savings on the time resource, as non-functional reports imply elaborate data manipulation to generate basic indicators.

- **Repair FIMS Fishing Trip Selectivity**

It found that the “fishing trip selectivity” of FIMS is a result of a programming error. As a result of this error, so-called dummy trips have to be created whenever trips spanning two months exist. As this has timeliness implications for data-capture and potential to violate trip sequence in the database, repair of this error is as important as the functionality of reports and BITNAM expertise is required.

- **Ascertain and update the functionality of Clearance Certificate**

It is noted that the information generated under the Vessel Clearance Certificate program is important for management purposes and that this information must be

captured. The starting point for this activity is to pre-test the functionality of this application in FIMS, since this has not been used since its inception. Repair work must be in a logical consequence if the functionality is not superb. In the long-run, additional information fields need to be developed, corresponding to the modified form.

5.3 Data development and processing

5.3.1 Capture Clearance Certificate Data

It was also found that the information generated under the Vessel Clearance Certificate program is important for management purposes as this signals when the fishing vessels enter and leave Namibian fisheries. Immediate capture of this data has to be undertaken upon confirmation of functionality status. This is a continuous activity to be done by supervisors of fisheries inspectors. Performance indicators must be the number of documents captured per vessel and completeness of information generated under this program.

5.3.2 Punching of Tally Sheet Data

Tally data is intended to provide preliminary landings information as the data is available after every offloading. The data is not consistently captured and this delays statistical landings data annual reports. Even if captured, retrieval is not straightforward, as there are no standardized summary reports in FIMS. The main task to address this situation is for the supervisors to ensure those tallies are

regularly entered into FIMS and the data punched must be summarized for statistical reconciliation.

5.4 Improving data management

5.4.1 Improve data quality

Data quality essentially means ‘fitness for use’ of statistical products as judged by users for their purpose. With the realization that data quality enhances their credibility and usability, quality must be at the heart of fisheries data management and there must be widespread quality consciousness between data gathering and processing divisions.

Quality assurance requires guidelines, documentation, permanent monitoring and networking between end-users and data-producing divisions. The activities to be undertaken to embed quality considerations must subscribe to the realization that data quality is multi-dimensional and goes beyond the traditional view that equates quality with accuracy.

5.4.2 Ensure data completeness

The completeness of data provided by vessel captains is to be strengthened via continuous consultation with and feedback to fisheries observers. The MFMR-FOA Committee must provide data quality management. Supervisors of fisheries inspectors must ensure that all statistical reports or figures are collected and validated.

5.4.3 Ensure data accuracy and consistency

The study showed that statistical awareness and the drive for accuracy among the personnel involved in data collection and processing are low. To achieve data accuracy and consistency, divisions responsible for each data processing point must develop and implement explicit guidelines, stating methods and procedure for managing data at that point. Supervisors of each point must ensure that the data are validated prior to further processing or dissemination. The volume of validated data and work procedures must be well understood and followed by staff and performance indicates for progress on this activity.

5.4.4 Ensure timeliness of data

Lack of timeliness is perhaps the most nagging problem affecting fisheries data and more so for landings data. Logsheets data, though relatively timely since this data does not follow the same process as landings data, have been plagued with such problems as incompleteness, missing data sheets and a proliferation.

5.5 Repair of FIMS errors, provision of equipment and in-service training

It is important that FIMS errors and statistic reports are fixed as a matter of priority. An in-house training program needs to be arranged so that FIMS users are able

to appreciate the art of FIMS usage. Staff needs of Regional Offices (marine, aquaculture and inland fisheries) should be looked into and filled.

5.6 Statistical Reconciliation at landing points

MFMR strategic goal for timeliness of information require data to be available no more than a month after collection. There is enormous opportunity for this goal to be achieved in near future. Fishing companies as data primary producers need to advance from manual data recording that would subsequently avail the data in timely manner or making the data easier to disseminate and analyze.

6 Chapter 6: CONCLUSIONS AND RECOMMENDATIONS

It is important to note that implementation of the strategies rests with different functional divisions in the MFMR. Furthermore, there seemed to be trade-off between the critical mass of personnel required and the tasks needed to be performed. Personnel bottlenecks must have constrained strategic outcomes.

Key performance indicators must be drawn in respect of each strategic goal to monitor progress towards meeting the goals. It must also be noted that some problems can result from ineffectiveness (not doing the right things) or inefficiency (doing the right things poorly) or database delays. Monitoring must keep track of these changes to enhance the ability to adapt successfully to these changes.

Supervisors must receive progress reports quarterly of data being captured or retrieved into FIMS for them to get updated on the progress made or constraints realised.

In addition to quarterly progress reports, there must also be an annual review of the activities, with mechanisms for changing activities and targets, whenever necessary.

The study discovered the under-reporting in Namibia as attributed by the following factors:

- The MFMR needs to narrow the gaps between the fishing companies with MFMR regional offices and the MFMR regional offices with the Head office (statistics division) in Windhoek;
- Companies are only sent monthly returns towards the month end prior to landing verifications that determines the fund levies;
- Not all landings forms are typed and hand written copies are time consuming as at times the MFMR regional staff would have to liaise with companies to verify the unclear figures;
- Some companies would be reminded to submit in their monthly returns and this delays the process if the regional staff members do not follow them up on time;
- MFMR Regional staff members also take time to compile the monthly returns before sending them to head office for capturing; and
- No monitoring process of sending monthly returns from regional offices to head office in Windhoek.

But, in order to obtain reliable and updated information on fisheries management, the following strategies should be considered:

Strategy 1: Identify the main stakeholders in fisheries, their management roles and responsibilities or main objectives for data needs;

Strategy 2: Identify the information requirements of each stakeholder to support their roles in fisheries management;

Strategy 3: Identify manpower and other resources for obtaining required data from the collection to analysis;

Strategy 4: Design a simple procedure for data collection with respect to potential sources, tools and appropriate stratification to meet fisheries management;

Strategy 5: Determine the analysis process;

Strategy 6: Design database and other systems to support the storage, processing and sharing of data and information; and

Strategy 7: Disseminate the information

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8 Annex 1: Covering letter for respondents

P. O. Box 98639

Windhoek

Namibia

01 February 2013

Dear Respondent,

TO WHOM IT MIGHT CONCERN

My name is Toivo Pendapala Uahengo, pursuing a Master's Degree of Leadership and Change Management (MLCM) with the Polytechnic of Namibia. My student no is 9435840.

The research study is conducted for the purpose of completing a Masters Degree.

I am assessing the strengthening of fisheries data collection and management in Namibia.

The objective of the study is as follows:

- what are the best practice for fisheries management and reporting;
- causes for under-reporting on the fisheries industry;
- policies used to control the fishing industry worldwide;

- policies in place in Namibia; and
- Strategies in place for dealing with under-reporting; in order to prevent the lack of data flow leading to under-reporting in the fisheries.

This research is directed to the staff dealing with fisheries monthly landings returns in the Ministry of Fisheries and Marine Resources and Fishing companies respectively. I would really appreciate your participation in this study by answering the questions that the research would ask you to answer.

In answering each question, please be as objective as possible remembering that biases sometimes cloud the real answer. Your responses should reflect the situation in your life, community. The validity of this research largely depends on the accuracy of your answers.

I also would like to assure you that all information obtained from questionnaire will be treated confidentially and participants' identity will remain anonymous. When the data has been processed, the questionnaire will be destroyed.

Thank you in advance for your participation in this face-to-face interview.

Yours Sincerely,

Toivo Pendapala Uahengo

Tel: 061 2053165

Cell: 0811495525

Email: uahengot@gmail.com

9 Annex 2: Fisheries monthly landings' return survey questionnaire

Date of Interview

.....

The name of the region where the interview is conducted

.....

Section A. Correspondent details

1.1 Full Names:

1.2 Current position's held:

1.3 Organization / Fishing Company employed:

Ministry of Fisheries and Marine Resources (MFMR)	Luderitz	
	Walvis Bay	
	Windhoek	
Fishing Company	Walvis Bay	
	Luderitz	

1.4 How many years employed in that organization/company:

1-5.....

5-10.....

10-15.....

15 and above.....

1.5 Roles played in monthly landings returns:

Compiling landings monthly returns	
Collecting and sending to Windhoek	
Punching information into FIMS	
Extracting and analysing information from FIMS	
Compiling reports	

Section B: Fishing companies

2.1. Name of company:

2.2 Please indicate the quota species allocated to your company:

1. Hake	
2. Monk	
3. Horse mackerel	
4. Small pelagic	
5. Large Pelagic	
6. Rock lobster	
7. Crab	
8. Linefish	

2.3 The Company possesses the following:

Own fishing vessel	
Own fish processing factory	
None of the above	

Please provide the name of the company processing your fishing:

.....

2.4 Please indicate the problem(s) you are experiencing with regard to the compiling, collecting and submitting of fisheries landings monthly returns

.....

2.5 Please provide possible solution (s) in solving the problems mentioned in 2.4:

.....

.....
.....

Thank you very much for your participation in this important study; your time and opinions are highly valuable and greatly appreciated.