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AN OVERVIEW OF NAMIBIAN FISHERIES, FOCUSING ON MONITORING, CONTROL AND SURVEILLANCE

By
Per Erik Bergh and Sandy Davies[26]

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26 .Written and compiled by Per Erik Bergh and Sandy Davies. POBox 2868, Walvis Bay, Namibia. Tel/Fax: +264 64 207738. E-mail: <pebergh@fisheries.gov.na> or <sandy.davies@iafrica.com.na>

LIST OF ACRONYMS USEDLIST OF ACRONYMS USEDLIST OF ACRONYMS USED

EEZ	exclusive economic zone
FIMS	Fisheries Information Management System
GDP	gross domestic product
GPS	global satellite positioning system
MCS	monitoring, control and surveillance
MFMR	Ministry of Fisheries and Marine Resources
RPL	Recognition of Prior Learning
TAC	Total Allowable Catch
VMS	vessel monitoring system

FOREWORD

This document was prepared as background for a talk on Monitoring, Control and Surveillance (MCS) in Namibia, and it was felt useful to provide it in solid form.

The lead author has been for last three years working in Namibia with two roles: firstly, that of adviser to the Ministry of Fisheries and Marine Resources (MFMR) on MCS: and, secondly, as Programme Manager for a Norwegian company responsible for the training of Ship's Officers, Inspectors and Observers; the manning of Patrol Vessels; and the running of the Operations Centre.

This document gives a general overview, although concentrating on the areas where the two authors are most involved.

The document falls into three sections:

- The first is a simple overview of Namibian Fisheries with some historical context and facts and figures.
- The second is the core of the MCS work. It covers the work of different sections of MCS in Namibia and then moves on to discuss the potential for vessel monitoring systems (VMS)vessel monitoring systems (VMS)vessel monitoring systems (VMS) in the Namibian context, and the training of observers and Inspectors.

The senior author would like to thank FAO for inviting him to join the workshop, and hopes that the material in this paper will be useful to the other participants.

Per Erik Bergh and Sandy Davies

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1. AN OVERVIEW OF NAMIBIAN FISHERIES.

1.1 INTRODUCTION.

Namibia is a country situated on the west coast of Africa, north of South Africa and south of Angola. The country is six times larger than the United Kingdom, but with a population of only 1.7 million people. This makes Namibia one of the least populated countries in the world. Perhaps the main reason for this is the harsh climate, which is both hot and dry, leaving desert and semi-desert covering large areas of the country.

The country has a coastline of 1 700 n mi, more than 3 100 km, running north to south. Perhaps surprisingly, historically the inhabitants of Namibia have not settled along the coast: most are farmers living inland without any tradition of use of the sea or its resources for food or income.

Politically, the country has had a mixed history, with periods spent under British, German and South African administration until in 1989 the people of Namibia won their Independence. Since Independence and the establishment of the exclusive economic zone (EEZ)exclusive economic zone (EEZ)exclusive economic zone (EEZ) in 1990, Namibia has developed a fisheries administration and a thriving commercial capture fisheries industry that has grown rapidly, and become increasingly more Namibian:

- The fishing industry is based on the high productivity of the Benguela Upwelling System, one of the four eastern boundary upwelling current systems in the world.
- Fisheries currently contribute about 7% to the country's gross domestic product (GDP)gross domestic product (GDP)gross domestic product (GDP).
- The fishing industry employs an estimated 12 800 people.
- In 1996, 309 vessels were licensed to fish in the Namibian EEZ, with three-quarters of these carrying the Namibian flag.
- The export value of the fish was estimated at $US 300 million in 1996.
- The outlook for Namibian fisheries looks promising with environmental conditions returning to an apparently more normal state and further expansion occurring in the deep-sea and other fisheries.

1.2 THE HISTORICAL CONTEXT.

1.2.1 Pre-Independence.

The history of the Namibian fisheries is similar to that of many countries that had no historical interest in fishing, but was compounded by the political situation of foreign administration until Independence in 1989. Prior to independence, South Africa controlled Namibia and from the fisheries point of view managed the 12 n mi territorial waters, which was essentially only the small pelagic stocks of pilchard, and rock lobster.

The fish stocks found outside of the territorial waters went unmanaged and open to over-exploitation by distant-water fishing fleets. The fishing pressure was high, especially on the demersal hake and monk stocks by the South African and the Spanish fleets, while the mid-water horse mackerel was targeted by the former USSR, Bulgaria and Poland.

This uncontrolled drive for maximum rather than sustainable catches continued until the early days of independence, and meant that the new Namibia inherited a depleted and severely damaged fishery.

1.2.2 Post-Independence.

Namibia's fisheries management regime started with the establishment of a 200-n mi EEZ in 1990. Initially, Namibia had no means to enforce the new border: they informed all countries with fleets in the EEZ of the new zone, but an estimated fleet of nearly 200 large factory trawlers continued to fish along the continental shelf.

Namibia tried to use diplomatic channels to resolve this problem but without success. So, in November 1990, they moved in with force, and arrested 5 Spanish trawlers through a helicopter operation in the EEZ. Armed Inspectors were hoisted down to the vessels and dropped directly onto the decks in a very dramatic but effective arrest tactic. Following this, which resulted in Namibia confiscating the vessels, imprisoning the captains and imposing large fines, illegal fishing was reduced for a period.

The Government of Namibia set out its fisheries policies in December 1991 in a White Paper entitled *Towards Responsible Development of the Fisheries Sector*. Policies outlined in that document were translated into legislation by the new Sea Fisheries Act, which came into force on 1 October 1992.

Initially, Namibia had almost no indigenous resources for research and surveillance operations, so sought international assistance. Iceland provided support for research – scientists for stock assessment and officers for the research vessels *Benguela* and *Welwitschia* – from August 1990; Norway provided assistance from mid-1991; and DANIDA came in a year later. Namibia also developed cooperation with Norway, France and Germany. Norway and Denmark provided three patrol vessels and funding for a helicopter. France provided a fixed-wing aircraft. Through these programmes, Namibia saw the first patrol vessels operational in late 1991. This reduced the illegal fisheries but it did not stop them. In March 1992, two Spanish trawlers were operating illegally in the EEZ. This time the patrol vessels were used in a mission that lead to the armed patrol vessels firing on the Spanish ships to force them into international waters. The two last patrol vessels became operational in early 1993.

Unlicensed fishing activities are now almost completely prevented through the continuous presence of patrol vessels as well as aerial patrols. Illegal fisheries in the sense of irregular equipment and dumping have been reduced through regular inspections and an increasingly competent observer cadre. Of course there are still illegal operations performed by the fishing vessels, but the situation is considered to be under control. Fish stocks are now recovering, due to a committed management programme and the power to enforce the law.

1.3 THE MINISTRY OF FISHERIES AND MARINE RESOURCES.

The Department of Seafisheries was until 1991 under the Ministry of Agriculture, but was then transformed into a full Ministry, the Ministry of Fisheries and Marine Resources (MFMR)Ministry of Fisheries and Marine Resources (MFMR)Ministry of Fisheries and Marine Resources (MFMR).

1.3.1 Responsibilities of the Ministry of Fisheries and Marine Resources

These include:

- *Conservation and Sustainable Exploitation* Conservation of the living resources both within the EEZ, on the high seas and in inland waters, and the encouragement of their efficient exploitation.
- *Protection of EEZ Rights* Protection of Namibia's sovereign rights over the living resources of the 200-n mi EEZ.
- *Sectoral Administration* Maintenance of the legal and administrative framework necessary for the management and development of fisheries activities.
- *Research* Continuous assessment of the biological, environmental, economic and social impact of fisheries and marine resources exploitation.
- *Institutional Development* Establishment and maintenance of the institutional framework for the development of the human resources needed by both the fisheries industry and the administration.
- *Industrial Promotion* Promotion of the economic viability of the fishing industry and the optimal production and utilization of fishery products.
- *International Collaboration* Participation in multilateral organizations and agreements, especially within the SADC region, to promote regional and international cooperation beneficial to management and development of the fisheries sector in Namibia.

1.3.2 Organization and functions.

The organization of the Ministry reflects the above responsibilities through one Directorate concerned with research and resource management and one Directorate dealing with the operational aspects of fisheries management and the administration of the Ministry.

The formal establishment and organizational structure of the Ministry was put in place on 1 April 1991, but was revised in the course of the later rationalization undertaken in the public service.

Directorate of Operations

The Directorate of Operations is entrusted with the practical management, registration and control of fish exploitation. It is responsible for the application and enforcement of all fisheries legislation, and the specific management measures and conditions applicable to fishing rights. The Directorate also provides the Ministry with general administration, personnel, finance services, planning, statistical and economic analysis functions.

More specifically, the Directorate manages the whole administrative process of aquatic resource utilization. In the marine sector this comprises the application of rights of exploitation and fishing quotas, the issuance and administration of fishing licences, and the collection of quota fees and other levies. It undertakes economic research and maintains all fisheries statistics. It ensures that fisheries laws, regulations and specific conditions are enforced through monitoring, control and surveillance (MCS)monitoring, control and surveillance (MCS)monitoring, control and surveillance (MCS) of fishing activities.

Directorate of Resource management

The Directorate of Resource Management undertakes research to provide advice on the optimal utilization of fish resources. It endeavours to provide sufficient information to ensure that the aquatic resources are managed so that the ecological balance is maintained and fish stocks are exploited on a sustainable level. Research by staff of the National Marine Information and Research Centre (NatMIRC) is mostly based in Swakopmund, but also with major research efforts in Lüderitz. The principal role of the Directorate is to provide advice to the Minister and the Sea Fishery Advisory Council on:

- the status of stocks and recommendations on their appropriate yields under the current management regime; and
- necessary measures for protecting resources, such as species and fish size limitations, closed seasons, closed areas, and limitations on the types and effectiveness of fishing gear.

To make recommendations on these matters, the Directorate carries out stock assessment surveys and scientific research on fish, marine mammal and bird stocks, on biological, chemical and physical oceanography, limnology of marine and fresh waters, and on a wide range of supporting research themes. As a result of such work, the scientists also contribute to the ever-improving understanding of the aquatic environment at both the academic and practical levels.

Sea Fisheries Advisory Council

In addition to the central management function of the Ministry, the *Sea Fisheries Act*, 1992, requires the Minister to consult the Sea Fishery Advisory Council before determining the Total Allowable Catch (TAC)Total Allowable Catch (TAC)Total Allowable Catch (TAC) for the species to which a management method applies (not all species are managed in this way). Recommendations for the utilization of fish stocks, resulting from scientific research, are presented to the Council.

The Council is chaired by the Permanent Secretary MFMR, and currently consists of 20 members drawn from MFMR, other ministries, private persons with fisheries expertise and from the fishing industry. The recommendations on the management and development of fisheries and, in particular, on the annual setting of the TACs, are submitted to Cabinet for approval.

Southern African Development Community

In August 1991, the SADC Council of Ministers formally allocated coordination of the Sector for Marine Fisheries and Resources to Namibia. MFMR was designated to carry out the coordination function on behalf of the Government of the Republic of Namibia. The Ministry in turn established a SADC Sector Coordinating Unit within MFMR, with the task of providing the region with leadership and guidance in the formulation, evaluation, management and implementation of specific policies, programmes and projects for the development of the Marine Fisheries and Resources Sector.

The Sector Coordinating Unit performs responsibilities and duties of a regional nature, but it is an integral part of the MFMR, and is hierarchically under the authority of the Permanent Secretary, Minister and Cabinet.

1.4 POLICY AND FISHERIES MANAGEMENT.

1.4.1 Fisheries Management .

The Ministry has adopted two broad categories of management and control measures:

- *Input controls* These relate to fishing effort and gear, and to the permissible time and place that fishing may take place, mainly by the limitation of total fishing effort and seasons; and
- *Output controls* These relate to set limits and regulations on the amount of fish that may be caught, and on the size and other characteristics of the fish that may be landed. The main control is by the establishment of TACs and quota allocations.

Currently, one of the main resource management challenges remains the regulation of fishing capacity at a level consistent with the potential yield of fish stocks, i.e., fishing effort control. Ensuring that potential yield is close to maximum depends on successfully rebuilding stocks using a complex mixture of both input and output controls. For each of the fisheries, a rebuilding strategy has been defined in general terms.

Essentially, scientists need to estimate the total mortality of fish stocks from both natural and harvesting causes in order to predict the effects of these on the biomass of the stocks over time and thus estimate what amounts can safely be harvested, i.e., TACs. Unfortunately, complicating these estimations is the uncertainty surrounding the levels of natural mortality that may result from changes in the environment or biological interactions.

The fisheries management strategy thus requires substantial information and research to provide policy-makers, management and the industry with continuing and sound scientific advice. The success of this strategy is evident in the TAC increases since 1990, although recent oceanographic events necessitated TAC reductions in 1997, but 1998 has seen more increases. The information and scientific analyses now available should enable the Ministry to refine and improve its predictions in the future. The improving accuracy of predictive capabilities and results must be taken into account, even though there may be political and economic pressures to maintain catches at levels supporting current investment in the fishing industry.

1.4.2 Policy Development.

While environmental uncertainties must always be recognized as an issue in any strategy for the industry, the Government of Namibia has accepted that some level of certainty for fishing companies must be in place. A clear statement of government intent in the development and management of the fisheries sector has therefore been made, and the mechanisms for long-term rights and fish quotas established.

Details of the new system of long-term fishing rights and vessel quotas were set out in the *Policy Statement of the Granting of Rights of Exploitation to Utilize Marine Resources and on the Allocation of Fishing Quotas* of 8 July 1993.

That statement spelt out the critical main sector issues for the medium term, under the following headings:

- Maintaining stock recovery.
- Compliance Control.
- Industrial development.
- Namibianization.
- Advancement of socially or educationally disadvantaged persons.
- Strengthening the MFMR effectiveness.

•Successfully promoting regional cooperation in marine fisheries.

1.4.3 Total Allowable Catches.

TACs set for the various species each year are given in Table 1.

Table 6 Total Allowable Catches 1992-1997 (tonnes)

SPECIES	1992	1993	1994	1995	1996	1997
Pilchard	80 000	115 000	125 000	40 000	20 000	25 000
Hake	90 000	120 000	150 000	150 000	170 000	110 000
Horse mackerel	450 000	450 000	500 000	400 000	400 000	350 000
Crab	6 000	4 900	4 900	3 000	2 500	2 000
Rock Lobster	100	300	130	230	250	250

Annual landings for all species combined were within the TAC levels in 1992-1996.

1.5 THE FISHERIES.

The Fishing grounds off the Namibian coast are among the most productive in the world. The cold water from the Benguela Current moves north from the southern oceans around Antarctica and flows northwards along the coast of southern Africa. The current causes an upwelling known as the Benguela Upwelling System, one of the 4 eastern upwelling systems of the world. This system supports large volumes of plankton, which in turn support rich populations of demersal and pelagic fish.

Rights of Exploitation are granted for the following fisheries and species: crab; demersal hake (both demersal trawl and longline); demersal monk and sole; orange roughy; alfonsino; linefish; rock lobster; mid-water trawl (mainly horse mackerel); small pelagic purse seine (mainly pilchard, anchovy and juvenile horse mackerel); tuna (longline, pole and line, purse seine); aquatic plants; seals; and other species or fisheries which applicants may specify.

1.5.1 Demersal Fishery.

Catches of demersal species – especially hake, monk, kingklip and sole – make up the most valuable fishery in Namibia. Currently, hake is the only quota-restricted species in this fishery. Hake is fished by freezer and wet-fish vessels, mainly bottom trawlers and some longliners. Hake landings have been within the TAC limits.

1.5.2 Purse Seine Fishery .

The purse seine fishery decreased dramatically from a high in 1994, but in 1998 there were positive signs of improvement as environmental conditions returned to an apparently more normal state.

The horse mackerel landed is allocated from the overall horse mackerel TAC, but anchovy and others are not quota controlled.

1.5.3 Mid-water Fishery .

The mid-water fishery targets horse mackerel. This fish is caught by both mid-water freezer vessels and as a by-catch to the purse seine fishery.

Table 7 Horse mackerel quotas and landings (1992-1996; tonnes)

YEAR	QUOTAS		LANDINGS	
	Mid-water	Purse Seine	Mid-water	Purse Seine
1992	300 000	150 000	310 000	116 000
1993	350 000	100 000	401 000	74 000
1994	400 000	100 000	331 000	33 000
1995	335 000	65 000	259 000	51 000
1996	331 000	90 000	229 000	91 000

1.6 THE FISHING INDUSTRY.

Since 1991, the total number of vessels licensed to fish in Namibian waters has increased annually, except for 1996, when a decrease of 7% was experienced. This can be ascribed to the sharp decline in the mid-water trawl fleet. The owners of such vessels were formerly subsidized by their governments, and no longer find it viable to fish in Namibian waters. Of all vessels licensed in 1996, three-quarters were flying the Namibian flag, an increase of 26% over a period of five years.

In 1996, 309 vessels were licensed, of which 23 were over 100 m long, while the average was 40 m. Although 79 of these vessels were operating under a foreign flag, this is not a good way to measure foreign interest and investments in the Namibian fisheries. Most of the industry is in cooperation with a foreign company through franchisee arrangements, so basically all the fish ends up in either Japan, Russia, Spain or the USA.

2. MONITORING, CONTROL AND SURVEILLANCE.

2.1 AN INTRODUCTION TO MONITORING, CONTROL AND SURVEILLANCE IN NAMIBIA.

The management of Namibian fisheries requires an integrated approach to MCS, involving the deployment of fishery officers to air, sea and land patrols; observer coverage on fishing vessels; and remote electronic monitoring. Monitoring and protection activities are designed to ensure compliance with the legislation, policies and programmes that relate to the conservation and protection of Namibia's marine resources.

2.1.1 Sea MCS.

MFMR has two coastal patrol vessels, used for patrolling closed areas, boundary areas, and conducting inspections at sea to ensure compliance with all of the regulations designed to ensure well managed fisheries. Random inspections are undertaken at sea from the fleet.

As a part of MFMR's Conservation and Protection efforts, the Ministry deploys contracted observers on all vessels fishing in Namibian waters. These observers gather scientific information on the catches, and provide on-site monitoring of compliance with fisheries regulations. They are

able to report infractions such as dumping or discarding, fishing in closed areas, cases of off-shore pollution, mis-reporting of catch, retention of prohibited catch or use of illegal gear.

Captains must complete logsheets on a daily basis and the observers check this information. This provides important information on catch and effort, which complements the observers' scientific data. Researchers also run regular survey cruises to assess the biomass of marine stocks.

2.1.2 Aerial MCS.

Aircraft are used to monitor, locate and track fishing fleets and detect violations such as fishing in closed areas. The aerial presence also serves as a visible deterrent to illegal fishing and allows more effective deployment of patrol vessels.

2.1.3 Land MCS.

Fisheries Inspectors provide another means of verifying the amount and type of fish landed. Inspectors monitor the off-loading of fishing vessels as they bring their catch ashore at either of the two ports. This provides the accurate landing information required for calculation of levies and for quota control, scientific evaluation of fish stocks and fisheries management. This effort is complemented by the random vessel inspections, carried out by Fisheries Inspectors from the patrol vessels.

2.1.4 Remote MCS.

Remote electronic monitoring of fishing vessels, using satellite tracking, is still at the pilot stage. Currently five Namibian fishing vessels are voluntarily carrying satellite-tracking devices. If the pilot project is successful, the use of satellite transponders may be extended to a larger number of Namibian offshore and mid-shore fishing vessels. Vessel owners will also benefit from this technology, as it will provide Search and Rescue information, real-time information on changing markets, and the ability to sell their catch as it is brought on board.

This aspect of MCS in the Namibian context is discussed further in Section 3.

2.2 RESOURCES REQUIRED FOR MONITORING, CONTROL AND SURVEILLANCE.

2.2.1 Human resources.

Good documentation or manuals, although a major asset, will never be able to replace the quality needed in the personnel allocated to perform the task. It should also be considered whether a well trained, better paid, smaller workforce results in higher productivity than a less competent, large workforce? This is of course dependant on:

- knowledge levels;
- recruitment procedures;
- probability of bribes;
- training capacity;
- professional attitude of the organization; and
- political and social requirements of the country.

These factors are often underestimated and the senior management of the operation is seldom unbiased in its evaluation.

2.2.2 Hardware and equipment.

Hardware – in the sense of vessels, aeroplanes and equipment – is often a crucial factor in the cost effectiveness of the operation. The level of control needed, knowledge, experience and running costs should be given serious considerations in the planning phase, before project initiation.

Lessons that have been learnt the hard way by many countries are that:

- Introduction of advanced technology has been an obstacle later in the project due to underestimated training needs and capability of human resources.
- High investment costs and underestimated running costs result in low MCS efficiency as activities are minimized to keep allocated budgets under control.
- Secondhand items have been purchased without clear terms of reference and analyses of actual needs, resulting in unsuitable equipment for the task and low MCS efficiency.

It cannot be stressed enough how important a well conducted needs analysis, including an integrated approach to hardware and human resources, is to the development of any MCS project.

2.2.3 Information management.

Large amounts of varied information are generated in MCS activities. Some of this needs to be available almost immediately for surveillance activities, while other information is needed over a long time-series to monitor the state of the fish stocks. These different requirements for information make good information management vital. The definition of *good* is not an easy one: striving for accurate and timely information is important, but also concerns of what information and in what format are vital questions. It is far to easy to collect too much information, which is then a burden on the administration and database systems for compilation, checking, storage and retrieval.

In 1993, MFMR embarked on a major programme to improve the quantity, quality, flow and management of information concerning the fisheries sector. This system – known as the Fisheries Information Management System (FIMS)Fisheries Information Management System (FIMS)Fisheries Information Management System (FIMS) – is a fully integrated database, aiming to facilitate improved information flow, required for the effective management of the resources. However, it appears that FIMS was an overambitious database for the Ministry, which was previously functioning nearly totally on manual systems. Implementation has been difficult and training of personnel to maintain the system is taking longer than envisaged. It is hoped that the FIMS will continue in a streamlined version that the Ministry is more easily able to support.

2.3 TRAINING FOR MONITORING, CONTROL AND SURVEILLANCE.

The Government of Namibia, early in its development of an MCS capacity, identified training as the key factor to build up local knowledge and experience. The short-term MCS goals – in the sense of reduced illegal fisheries – were reached early on, but the largest challenge was left: human resources development.

The Namibians involved at Inspector and Observer level were eager and motivated, but not very well educated for the task. Several donor organizations supported plans to build up an educational organization to solve this problem. Quite a few educational programmes were initiated in the early 1990s, but only programmes related to the MCS function are considered here.

2.3.1 Patrol vessel officers.

The two patrol vessels (initially three) were from the beginning manned with Norwegian and Danish officers and crew to solve the immediate lack of trained Namibians in the first few years after Independence. A successful training programme produced a Namibian crew within the first year. However, officers require a more long-term perspective and a cadet programme was established, aiming for internationally recognized maritime certificates as well as specialized training for patrol vessel duties.

Table 8 The MFMR Cadet training programme

Intake	Start date	Number and type of cadet	Graduation date[1]	Remarks
Class I	Feb. 1992	2 Deck Officers	December 1996	Passed/In service
			February 1997	
Class II	Aug. 1992	4 Deck Officers	December 1996	Passed/In service
		2 Engineers	February 1997	Passed/In service
Class III	Feb. 1993	6 Deck Officers	December 1997	Passed/In service
Class IV	Feb. 1994	5 Deck Officers	(Oct.-Nov. 1998)	
		2 Engineers	June 1998	
Class V	Feb. 1995	9 Deck Officers	(Oct.-Nov. 1999)	2 Female Cadets
		10 Engineers	(June 1999)	2 Female Cadets
Class VI	Feb. 1996	8 Deck Officers	(Oct.-Nov. 2000)	2 Female Cadets
		6 Engineers	(June 2000)	
Class VII	Feb. 1997	3 Deck Officers	(Oct.-Nov. 2001)	
		5 Engineers	(June 2001)	

Note: (1) Expected dates in parentheses.

MFMR started the first intake of cadets in February 1992, and the latest was in February 1997. The total number of Cadets at this stage is 48, with 14 officers having completed their education so far. The number of cadets and officers in training or in service are shown in Table 3.

The engineer officers are trained to the level of a Class 3 certificate. The deck officers are trained to the level of a Class 4 certificate. 12 students will be selected for scholarships to proceed to the level of either Master Mariner or Chief Engineer (Class 1). This programme scholarship programme is due to start in January 1999.

The goal of MFMR is to cover all officer positions by Namibians on the patrol vessels by the year 2002. Another benefit will be the maritime competency that not only Ministry but also the maritime environment in Namibia will gain from this programme.

2.3.2 The Fisheries Inspector and Observer programme.

The inspectors and the observers that were employed in the early 1990s were poorly educated, without any experience in the fisheries sector and confused by the expectations they met from the industry. Education was desperately needed to reach the goals of the Ministry.

The initial documentary work that had to be done was to:

- create an occupational standard for Fisheries Inspectors and Fisheries Observers;
- create a curriculum document for a future course; and
- create a module description for the subjects approved in the curriculum.

The documentation was finalized in May 1995, and was implemented with the first course, starting in July 1995.

To date, three courses have been run based on the above curriculum, with certain *ad hoc* adaptations as required. In 1998, a review of the course was undertaken to evaluate and update the curriculum and course, and the results of that review are reflected in this paper.

The course was established initially as a 32-week course (16 weeks theoretical and 16 weeks in-service training). The theoretical training is the same for both categories, with specialization occurring in the practical period. This means that a Fisheries Observer can additionally complete the Fisheries Inspector In-service training to be awarded the Fisheries Inspector Certificate from the Polytechnic of Namibia, that accredits the education.

The course was later expanded with both a language module and a FIMS (Fisheries Information System) module. Several of the existing modules were rewritten in an internal review process in 1997 to reflect new areas. The course was subsequently modified to 24 weeks theoretical and 12 weeks in-service training. The course contains legal subjects as well as biological and maritime subjects.

The number of students on each course has been 25, 15 Fisheries Observers and 10 Fisheries Inspectors. The course design as a whole is based upon the principles and concepts of vocational adult learning. Lecturing staff are trained in adult education principles and techniques to allow the implementation of this method. The course was, and is intended to be, a basic entrance course into the profession as a Fisheries Inspector or Fisheries Observer, where passing the course is a requirement for future employment. The Course structure and content are considered in more detail in Section 4.

2.3.3 The Observers Commercial Sampling Programme.

The observers, numbering around 230, have traditionally worked as MFMR's eyes and ears at sea. Their duties have revolved around monitoring compliance of fishing vessels with fisheries law; this principally includes tasks such as checking gear specifications; monitoring the by-catch; assuring that no dumping occurs; and compiling data on catches and operations.

However, in 1996, the Ministry expanded the brief of observers to meet the information needs of stock assessment by training and equipping them to monitor and collect biological information on the catches. The programme that evolved has become known as the Commercial Sampling Programme.

The training programme has been developed as an extension of the Fisheries Inspector and Observer Course, with observers taking a maximum of four additional short courses, with periods of sea time and practical experience between each course. These stages have been developed around the scientific requirements of the programme, with the basic requirements of collecting length frequency and catch and effort data being taught in Stage One. This then progresses to more complex data collection, such as sex determination and full catch composition estimation, in Stage Two, with species specialization and advanced fisheries management in Stage Three. Stage

Four will be for the most capable observers, who show ability to act in a supervisory role for a designated fishery.

Observers will start by taking the one-week course on shore to the level of Grade One before joining the Fisheries Inspector and Observer Course. If successful, they will be able to take the Grade Two level of commercial sampling training, which is made at sea.

To date, 105 observers have been trained to the Grade One level and 51 have advanced to Grade Two. During July 1998 the Ministry planned to launch the Grade 3 training. During 1997 alone, over 500 sampling trips were made by the trained observers, who returned with data on the fisheries resources. The data were computerized and used by the Ministry scientists in stock assessment modelling.

As well as training the observers, the Ministry has been training Inspectors and Technicians to train the observers in the future. To assist them, documentation has been developed for each Grade, including an observer manual, a curriculum document and an instructors guide.

2.4 OTHER MONITORING, CONTROL AND SURVEILLANCE OPTIONS .

Governmental duplication of MCS tasks is common and often creates some discussion on where responsibilities should be allocated to maximize effects or to reduce costs. This can easily result in compromises, where the fisheries surveillance element loses. It is quite obvious that a diverse task requires a broad knowledge of the operations, with priority being directed to the main purpose.

2.4.1 Navy .

The Navy is normally neither designed, educated nor particulary trained for fisheries MCS operations. The organization can be a valuable asset in the sense of border violations by unlicensed vessels, but seldom efficient with catch or equipment controls.

2.4.2 Coastguard.

A Coastguard is far more appropriate for fisheries protection tasks although less advanced than a navy in terms of training and equipment. A coastguard is normally designed round the United Nations Convention on the Law of the Sea, with basic police tasks to perform, and with emphasis on border violations, fisheries, Search and Rescue Operations, customs and immigration tasks.

3. PROGRESS WITH VESSEL MONITORING SYSTEMS IN NAMIBIA.

3.1 CURRENT SITUATION.

Satellite-based technology for monitoring fishing vessels and fishing activity has now become an accepted and effective fisheries management tool. This tool permits two-way communication between the vessel and receiving stations, providing many options including electronic tracking and reporting.

Sustainable utilization of marine resources has been a challenge for fisheries managers worldwide throughout the last decade. MFMR is also striving to introduce new and develop existing measures designed to protect and conserve the national fish stocks. These include

measures such as quota allocation for targeted species; limited by-catch of non-targeted species; controlled and closed area fishing in certain areas at certain times; and gear restrictions.

Effective monitoring and management of these conservation measures requires many inputs, one of which being decision making based on analysis of real-time data provided through the close monitoring and surveillance of fishing activities. Recognizing this need for accurate, reliable and up-to-date information, the fishing industry and government have been seeking new tools to help achieve this. On the leading edge of technological advancement, satellite-based communication systems provide a realistic tool for helping to achieve conservation goals in fisheries.

The initial interest in introducing a vessel monitoring system (VMS)vessel monitoring system (VMS)vessel monitoring system (VMS) into the Namibian EEZ was fuelled by the development of the successful deep-sea fishery targeting orange roughy. Currently, both the framework for the introduction of a VMS for our fisheries sector and the strategy for its implementation are being designed. However, the continuous development of hardware and software technology has delayed any decision in selecting the most suitable system for the country and its specific needs. Also, with the possibility of integrating global satellite communication systems and worldwide telecommunication systems to link those involved in the fishing industry both on land and at sea with the national law enforcement organizations, as well as any regional monitoring capacity, the decision can not be made taking into consideration only one set of interests.

MFMR is still in the process of determining the most suitable platform for development into the fisheries management programme, and has already tested several systems. To date, none have proven completely satisfactory. There are concerns over several issues including the cost-efficiency of the systems and the quality of performance as a good platform for MCS. Another factor of concern is that of testing the technology on a wide range of vessel sizes, not just the traditionally larger vessels. This will indicate to what extent the technology could be of benefit to small vessels and hence to further enhance the potential for fisheries management. Also, Namibia is concerned with regional cooperation in this field: it would be appropriate to develop regional standards for mutual support for monitoring of fishing fleets. This could be an issue to discuss through the forum of the SADC.

Through the testing of systems to date, there is an inclination towards a systems based upon Inmarsat-C and global satellite positioning system (GPS)global satellite positioning system (GPS)global satellite positioning system (GPS). This option would be suitable both for the Ministry and the industry, as many of the vessels already have this equipment installed. New radio regulations and international demands for the global maritime distress and safety system (GMDSS) also make this a sensible approach to solving problem.

3.2 NAMIBIA'S GOALS FOR VMS .

- *Improve compliance with fisheries legislation* – resulting in improved monitoring of fishing vessel activities. Improved compliance should provide more realistic returns to the government for granting access to fishing resources.
- *Automate monitoring and surveillance, cost-effectively and efficiently* – provide speedy identification of suspicious fishing vessel activity, which can then be targeted for further investigation or monitoring. Unknown vessel activity will easily be identified and surveillance operations can quickly be initiated.
- *Be scalable and flexible* – enabling cost-efficient enhancement and expansion of the system to meet future increases in processing volume or changes in business requirements.

- *Be secure* – with confidentiality of fishing vessel and movement information ensured through software security measures.
- *Be easy to learn and use* – through a user-friendly design.
- *Provide a source of fisheries information* – to be used by management personnel in economics or marketing analysis to assist in making policy decisions about the management and conservation of the fishing resources.
- *Integrate with biological information* – to provide information that can be used in stock management to allow real time decision making and control of the resources.

3.3 GENERAL ADVANTAGES OF USING A VMS.

Satellite-based technology has commercial and fisheries management applications and can be used to improve the overall efficiency of use of marine resources.

Commercial Advantages

- Vessel owners will be able to monitor skippers, the catch and vessel position.
- Direct, real-time communication with land-based operations will facilitate marketing efforts and enable messages or prices to be communicated.
- Communication channels can be used by crew members for access to weather reports, news, sports updates, etc.
- Skippers will be able to maintain vessel fish inventories.
- Satellite technology can contribute to the advancement of safety systems for vessel crews. Since regular position reports would be required, missed reports could be investigated. Accurate information on the missing vessel and other vessels in the area would help with any needed rescue efforts.
- Data collected on fishing activities such as fuel consumption could be analysed, leading to recommendations, for example, on how to optimize fuel use.

Fisheries Management Advantages

- Satellite-based technology can be used with traditional surveillance methods to enhance fisheries enforcement and control.
- Integration of satellite communications with the radar of airborne patrols helps extend the area that can be surveyed in a single flight, reducing person hours and operational costs.
- Data can be used to identify vessels that have reached their quota of fish.
- Reporting can be tailored to suit any type of monitoring required. Routine monitoring can be completed with several reports per day or, if closer monitoring of a vessel is needed, reporting can be required more often.
- Statistical data can be used to make decisions regarding the opening and closing of fishing areas.
- The number of on-board observers can be reduced.
- Tracking of foreign vessels can provide accurate and real-time data on the fishing activities of foreign fishers.
- The information transmitted via satellite can be used to verify logbook data on amount, size and composition of the catch.

There are potential **negative** implications, however, including:

- Foreign fishing vessels, in order to avoid being a part of the VMS or similar controls, may avoid the waters surrounding southern Africa. This could reduce the flow of the information that is gained from monitoring catches in these areas – information needed by scientists for fish stock assessment.
- Foreign vessels might make fewer port calls in southern Africa. This would have serious economic repercussions for the local ports. Were a VMS to be mandatory, many vessels might avoid these ports for supplies, crew rest, and catch transshipment. These ports could suffer a serious decline in fisheries-related revenues if foreign fishing vessels stopped calling there.

Nevertheless, one thing is certain: a VMS requirement for foreign vessels would provide Namibia as well as the region with unprecedented information on the fishing activity within its jurisdiction.

4. FISHERIES INSPECTOR AND OBSERVER COURSE CURRICULA

The Fisheries Inspector and Observer Course leads to either a Fisheries Inspector Certificate, or recognition of modules completed by Fisheries Observers.

4.1 OVERALL PURPOSE OF THE COURSE.

This course is designed to train Fisheries Inspectors and Fisheries Observers in the core duties and tasks of their respective jobs as identified by the Occupational Standard for Fisheries Inspectors. These duties and tasks cover the broad areas of duty and task skills; task management skills; contingency management skills; and job environment skills.

4.2 ADMISSION REQUIREMENTS .

Candidates must be at least 18 years of age, with good eyesight and medically fit for the job. The standard admission requirement is an Intermediate General Certificate of Secondary Education (IGCSE) certificate or equivalent qualification. The pass rate for English should be at least 50% or an equivalent grade.

4.3 RECOGNITION OF PRIOR LEARNING.

Recognition of prior learning (RPL)Recognition of prior learning (RPL)Recognition of prior learning (RPL) is applicable for adult learners who are resuming their formal education. The concept of RPL is based on the belief that many adults acquire prerequisite levels of learning and skills through work experience, community work, non-formal courses, self-directed study, travel and leisure activities. RPL has the objective of evaluating – in relation to stated objectives of formal qualifications – adult learning and skills that were acquired outside formal educational programmes.

Assessment of learners' levels of knowledge and competencies can involve a review of academic documents/portfolio, proficiency tests and examinations, essays, projects,

demonstrations of knowledge and skills, interviews and references. Recognition and credits are not awarded for experience, but only for verifiable learning that occurred as a result of that experience. The assessment of learning experiences must be done by subject-experts and experienced professionals. The assessment results can qualify a candidate for admission to courses or to obtain credits for courses required by a qualification. Credits can be obtained for either theory or practical experience, or both.

4.4 NATURE OF THE COURSE .

For both the Fisheries Inspector and Fisheries Observer courses, the course is

- modular;
- competency based;
- full-time;
- limited intake (25 for both Fisheries Inspectors and Fisheries Observers);
- 24 weeks theoretical and practical, plus 12 weeks in-service training; and
- one or two intakes per year.

4.5 CURRICULUM .

The curricula for both Fisheries Observers and Fisheries Inspectors are the same for the theory part, comprising three module groups and involving 861 programmed hours of lectures, tutorials and self-tuition. The practical element is 60 eight-hour days (=480 hours) for both the Observer and Inspector courses.

4.6 MODULE DESCRIPTIONS .

Group 1

English Communication Purpose: To enable Fisheries Inspectors and Fisheries Observers to master general communication skills, as well as communication skills specific to their duties. Duration: 140 hours. Prior requirements: None.

Fisheries Law Enforcement Purpose: To guide Fisheries Inspectors and Fisheries Observers to acquire the knowledge of relevant laws and their practical enforcement. Duration: 105 hours. Prior requirements: None.

Catch control and calculations Purpose: To enable Fisheries Inspectors and Fisheries Observers to determine the total catch and catch composition of fishing vessels compared to the catch logsheets. Duration: 91 hours. Prior requirements: None.

Fishing Technology Purpose: To enable Fisheries Observers and Fisheries Inspectors to determine the legality of marine fishing activities and processing operations. Duration: 91 hours. Prior requirements: None.

Introduction to Computers and FIMS Purpose: To enable Fisheries Inspectors and Fisheries Observers to use computers as an efficient tool in carrying out their duties. Duration: 35 hours. Prior requirements: None.

Group 2

Navigation Purpose: To enable Fisheries Inspectors and Fisheries Observers to pinpoint a vessel's position at sea, and to understand basic principles of navigation. Duration: 91 hours. Prior requirements: None.

Fisheries Biology and Management Purpose: To enable Fisheries Inspectors and Fisheries Observers to collect commercial samples and information and to understand the importance thereof for fisheries management. Duration: 49 hours. Prior requirements: None.

Fisheries Landings Purpose: To enable Fisheries Inspectors and Fisheries Observers to monitor through landings and harvesting of other marine resources. Duration: 35 hours. Prior requirements: *Fisheries Biology and Management*

Administration Purpose: To enable Fisheries Inspectors and Fisheries Observers to perform routine administrative functions effectively. Duration: 21 hours. Prior requirements: None.

Group 3

Radio Communication Purpose: To enable Fisheries Observers and Fisheries Inspectors to use VHF, MF and HF radio I.A.W. required regulations. Duration: 119 hours. Prior requirements: *English Communication*.

First Aid Purpose: To enable Fisheries Observers and Fisheries Inspectors to assess and respond to emergency situations. Duration: 35 hours. Prior requirements: None.

Basic Survival and Fire Fighting Purpose: To enable Fisheries Observers and Fisheries Inspectors to take appropriate personal and vessel safety precautions. Duration: 35 hours. Prior requirements: None.

Professionalism Purpose: To enable Fisheries Inspectors and Fisheries Observers to perform their various functions in a professional manner. Duration: 14 hours. Prior requirements: None.

4.7 SELECTION PROCEDURES.

- Limited-intake policy.
- Candidate's orientation with regards to job and career opportunities.
- Prior to course enrolment, Fisheries Observers must spend a period at sea to prove fit and motivated for the job.
- Candidate selection, including RPL strategies.

4.8 EVALUATION AND PROMOTION POLICY .

Competency-based training

Competency-based training is very systematic, where learning tasks or competencies are purposefully selected and grouped into modules. Every competency and module is therefore important and should be mastered to a certain level.

Assessment

To achieve this, learners are assessed on every learning task of each module on a theoretical and/or practical basis. Regular, short, non-grading tests or exercises should be used to assist learners to ascertain their mastery levels on a continuous basis.

Re-assessment

Learners who attended classes and practical training sessions and worked diligently may be allowed up to three chances to prove mastery of a specific task. As soon as the required mastery level for a learning task has been achieved, it is recorded on a learners' performance record, which reflects every module's learning tasks and their outcomes. At the end of each module, a final formal assessment of that module should take place. The format of this assessment can consist of oral, written or practical work in any combination. Once a module is passed, there is no further assessment on it, except for those learning tasks which require in-service assessment. A learner should be allowed to enrol only twice for the same module. However, the learner should be allowed three chances to prove mastery of each learning task within that module.

Certificate requirements

A learner is awarded a certificate when the in-service assessment is successfully completed. This in-service period follows upon successfully completing the modular theory and practical training.

4.9 CERTIFICATION.

Origin of Certificate

The Polytechnic of Namibia awards the Fisheries Inspector Certificate on successful completion of the course.

Recognition of modules

The recognition of modules completed by Fisheries Observers are recognized by the Polytechnic of Namibia on successful completion of course.

4.10 FURTHER STUDY POSSIBILITIES ENVISAGED.

Fisheries Observers

Fisheries Observers can go on to complete the remainder of the Fisheries Inspector Certificate (through in-service training).

Fisheries Inspectors

Inspectors can enrol for a second-year Polytechnic qualification (when needed by MFMR).

4.11 TEACHING PHILOSOPHY.

The philosophy underlying the teaching of Fisheries Observers and Fisheries Inspectors is based on principles and concepts of adult learning. High quality teaching and learning is strived for in a flexible, professional and fair manner. Lecturing staff should be trained in adult learning principles and techniques.

Teaching periods are 45 minutes long, with a 15-minute break between them. The period starting at 12:00 is an optional tutor period.

Learning groups consisting of learners only or learners and lecturers can meet on a voluntary basis to support learners. Individual learners can make appointments with lecturers for individual help during this period.

Afternoons, evenings and weekends are available for practical training or assessment.

Modules form three groups. As soon as a module is completed, another module from the next group starts in those periods. Module prerequisites should be taken into account to ensure that a module from the next group is not started before the prerequisite module from the first group is completed.

The philosophy behind the design of the timetable is that learners cannot concentrate on one topic for an extended period of time. The lengths of teaching periods are designed to allow for demonstrations, all types of group exercise or for use of audiovisual media. Lectures should preferably be no more than 20 minutes. Learners learn best by learning actively. The aim of the lectures should therefore not be to teach learners everything, but to facilitate active learning.

All learners do not master learning tasks at the same pace, nor do they use the same learning style. The additional noon tutor period offers extra time for some learners who do not learn best from being lectured to.

Learning is more effective when learners can integrate theory and practice. A double period allows that, and so do the "open" afternoons, where theory and practice can be combined. Learning is also more effective when learners get prompt feedback on their learning efforts. The timetable provides both lecturing staff and learners with ample time to give and receive oral and written feedback on learning tasks. This provides the opportunity for timely correction or repetition during the learning process.

The timetable is designed around resident lecturers. If lecturers from elsewhere are involved, it is recommended that only two modules be scheduled at any one time. These modules should not extend for a period of more than two weeks for economic reasons.

The format and arrangement of the curriculum pre-supposes the availability of a wide variety of teaching-learning resources. It is therefore logical that resources that support both teaching and learning should be acquired and managed appropriately. Resources should include books, international magazines, other printed materials, audiovisual equipment and software, etc.

All learners must receive the course outline for each module at the commencement of that module.

Lecturers must keep a performance record (reflecting all learning tasks) of learners' progress for each module. Each learner must have a similar document to monitor their personal progress.

4.12 STAFF DEVELOPMENT AND EVALUATION .

Lecturing staff should receive training in aspects of professional teaching, competency-based training, adult-learning principles, student feedback, the proposed training model and making use of the module descriptors.

The foregoing covers some of the principles needed to establish a teaching-learning philosophy for the course. This philosophy will enhance a coordinated and structured approach by all lecturers – an extremely important factor where lecturers with different backgrounds and experiences are teaching on the same course.

Continuous staff development is needed to ensure a high quality of teaching-learning. Apart from any other assessment methods, it must be accepted policy that lecturing staff should make use of student feedback assessments. This should be done for each module, every time it is presented.