REPUBLIC OF NAMIBIA

MINISTRY OF FISHERIES AND MARINE RESOURCES

Directorate Resource Management

General: The Benguela Current is one of the four main eastern boundary upwelling regions in the world and extends along the entire Namibian coastline. Coastal upwelling is the dominant oceanographic feature of all these systems and is responsible for the high productivity and high abundance of fish stocks that occur in these areas. Fishery is one of the major revenue generators in Namibia and the management of these renewable resources is imperative to ensure their long-term sustainability. The Directorate of Resource Management (DRM) is responsible for conducting research to determine the status of the stocks and providing scientific advice to ensure sustainable utilization of Namibia's living marine resources. DRM heads several research programmes, focusing on the commercially important fish species, such as hake, sardine, horse mackerel, monk, crab, rock lobster and orange roughy and the state of the marine environment. DRM is divided into three subdivisions: Pelagic, Demersal & Environment.

The research staff is based at the two research centers, National Marine Information and Research Center (NatMIRC) in Swakopmund and Luderitz Marine Research Center (LMR) in Lüderitz. A large component of the research and sampling activities required for the scientific advice is conducted at sea, using two research vessels, the *RV Mirabilis (Walvis Bay)* and the *RV !Anichab* (Lüderitz). The Directorate staff also participate in cruises by international research vessels such as the *Dr. Fridtjof Nansen* and the *RV Meteor*, among others.

Environmental research: The main objective of Subdivision Environment is to assess the state of the marine environment through regular monitoring research activities. Shipboard

monitoring and remote sensing form the basis of MFMR's environmental monitoring programme. The subdivision conducts 8-10 environmental surveys annually to research various physical, chemical and biological oceanographic processes key to the living marine resources. Parameters such as sea temperature, salinity, dissolved oxygen, nutrients (phosphate, nitrate, nitrite, silicate, and ammonium) are measured as well as information on phyto-, zoo- and ichthyoplankton species composition and abundance are recorded. The ADCP instrument onboard the *RV Mirabilis* enables the Subdivision to gather current (speed and direction) measurements crucial to understanding fish egg and larval transport that influences fish recruitment success.

A smaller staff component is based at the Lüderitz Marine Research institute and monitors the major upwelling centre off Luderitz. The Seabird & Offshore Island section also based in Lüderitz keeps conducts research on the seabird populations on all islands within the Namibian Islands` Marine Protected Area (NIMPA) to ensure their conservation. In total there are twelve islands within the NIMPA of which three are manned (viz. Possession, Ichaboe and Mercury). Officials on these islands keep daily records of seabird population trends, such as the numbers and breeding success of jackass penguins, gannets and cormorants-all of which are endangered species. These officers also do weather recordings, water sampling and keep bird predators at bay. Seabird numbers on Halifax Island near Diaz Point is also monitored.

Pelagic research: The objective of the Pelagic subdivision is to assess the state of the commercially valuable pelagic resources through research and monitoring programs to advice management on sustainable harvesting rates (i.e. Total allowable catches). Pelagic resources monitored regularly include small pelagic species (horse mackerel, sardine, etc.), large pelagic species (tunas and sharks), line-fish species (west-coast steenbras, silver kob, snoek, etc.) and marine mammals (Cape fur seals).

The Namibian horse mackerel, currently the most abundant **small pelagic** species is targeted by the mid-water seine fisheries, which accounts for the largest of landings in Namibia. The main target species of the purse seine-directed fishery is sardine, which used to be the mainstay of the Walvis Bay economy.

Both horse mackerel and sardine are surveyed annually to determine the relative abundance, spatial distribution,

biology and size composition of these two species, as well as the other small pelagic species such as, red-eye round herring and anchovy. The hydro-acoustics survey method is used. The horse mackerel and small pelagic survey covers the area between 17°15 to 25° 00' S, while the sardine survey follows the stock's distribution from 25° 00' S up to 16° 00' S in southern Angola. The surveys cover water depths from approximately 20m close to the coast up to the offshore limit of the stocks. Biological and fishery information is integrated in age-structured models to assess the state of the stocks on which TACs are based.

Recreational **line-fish** species are monitored on a randomized bi-monthly sampling program; beach surveys. During these surveys anglers along the beach are interviewed and the composition of their catches (species, number of fish and size) are recorded. The information is used to evaluate the effectiveness of the angling and fishing regulations which limits the number and the size of fish to be retained. Commercial line-fish catch and effort data is also recorded on skippers' logbooks. The performance of the fishery is used a as proxy for the state of the stock.

Most of the **large pelagic** species are highly migratory and cross the entire Atlantic Ocean and only occur in Namibian waters during a certain period of their annual migratory route, mainly for feeding. Thus, the monitoring program focuses on the performance of the fishery. As migratory species, catch information on these stocks is collected and submitted to the International Commission for the Conservation of the Atlantic Tunas (ICCAT), which is responsible for the management of these species,to assess the state of the stocks and subsequently allocate harvestable quotas to the different nations fishing.

Marine mammals, Cape fur seals, are monitored through an intense sampling program during the breeding and harvesting seasons, and a pup census every three years. The breeding season extends from 15th November to 15th January. On a daily basis the number of pups born, or lost (died), are recorded and their growth is monitored at specified sites. Pup growth is also monitored during the harvesting season (1st July to 15th November), at least bi-weekly and is used as the indicator of pup survival success and subsequent recruitment into the population. Every third year, an aerial census is conducted at the peak of the breeding period (mid-December), covering all colonies along the coastline, to count

the number of pups born which is used as a proxy for the population size. All available information is integrated into an age-structured production model on which set harvesting rates are based.

Demersal research: The Subdivision Demersal is tasked to conduct research and provide scientific advice to on the sustainable utilization of commercially important bottom and near bottom dwelling resources such as hake, monk, orange roughy, rock lobster and deep-sea crab. The Main research programs for Subdivision Demersal are (a) Hake, (b) Monk & Sole, (c) Deep-water Fisheries (Orange Roughy & Alfonsino), (d) Crustaceans (Crab & Rock Lobster), (e) Ageing and growth, (f) Observer and Exploratory Fisheries and (g) Ecosystem Approach to Fisheries (EAF).

Overall, Research survey activities conducted onboard the research vessels by Demersal are as follows**:**

- Swept-area trawling, targeting Hake (42 days during January/February), 17°-30°S, 80-700m
- Fish Capture, Behaviour & Gear Experimental for monk and hake (21 days during April/October), selected areas.
- Acoustic and Deep-sea trawling, targeting Orange Roughy (16 days during July), mainly 4 QMAs between 19°-27°S, 600-1300m
- Swept-area trawling, traps and diving, targeting Crab (16 days during August) and Lobster (10 days)
- Swept-area trawling for Observer training (6 days during May and 6 days during August), selected areas
- Swept-area trawling, targeting Monk (21 days during November), 19°-30°S, 100-800m

In total, about 140 days are needed to conduct demersal research activities onboard the research vessels to estimate the biomass of demersal resources and relevant biological parameters.

The National Marine Aquarium is an eyepiece to the Namibian marine environment for Namibians and visitors alike. It was inaugurated by His Excellency Dr. Sam Nujoma, in 1995 and has since then fascinated approximately one million visitors!

The main display of the aquarium is the oval tank with a capacity of 320 000 liters of seawater and an eight meter acrylic viewing tunnel. It hosts most of the Namibian angling fish species, such as cob, galjoen, steenbras and kolstert. Intertidal specimens are displayed in 17 smaller exhibits.

For those seeking a more interactive experience, the aquarium also boasts with a Ray tank, where people are encouraged to touch these magnificent animals.