APPENDIX 3

NAMIBIAN MARINE PHOSPHATE (PTY) LTD

A BRIEF HISTORY OF THE NAMIBIAN FISHERY

Sandpiper Project

Proposed recovery of phosphate enriched sediments from the Marine Mining Licence Area No.170 off Walvis Bay Namibia.

Environmental Impact Assessment Report for the Marine Component

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Enviro Dynamics
The CSIR

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ENVIRO DYNAMICS

March 2012

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A BRIEF HISTORY OF THE NAMIBIAN FISHERY, APPENDIX 3:

Project:
The Dredging of marine phosphate enriched sediments from Mining Licence Area No. 170

Date:
March 2012

Prepared for:
Namibian Marine Phosphate (Pty) Ltd.

Prepared by:
Dr. Jeremy David

Declaration:
I, *Jeremy David*, do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the South African Environmental Impact Assessment Regulations, 2010

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A BRIEF HISTORY OF THE NAMIBIAN FISHERY

1 Background

The waters off the coast of Namibia are among the most productive in the world, due to the fact that the continental shelf is part of one of the world's major eastern boundary current systems – namely the cold Benguela Current. The Benguela Current is bordered to the north by the Angola Current and to the south by the Agulhas Current, both of which are warm water currents. It flows towards the Equator and is deflected away from the coast by the Coriolis force generated by the Earth's eastward rotation and the prevailing southerly winds. This combination of factors leads to upwelling of the cold, nutrient-rich, bottom water along the whole southwest African coastline during much of the year. As a result, dense populations of phytoplankton multiply in the sunlit surface layers, which in turn support vast numbers of zooplankton. The constant solar radiation throughout the year allows almost continuous photosynthesis, which generates high levels of productivity within the Namibian marine ecosystem, and provides an ideal environment for pelagic fish to feed directly on the plankton and to realise a rapid rate of reproduction. In addition, dead plankton fall to the ocean floor and decompose, thus starting new food chains which sustain large populations of bottom feeding species, such as demersal fish, crabs and rock lobsters. In comparison with the other major eastern boundary current upwelling systems (the Humboldt, the California and the Canary), the Benguela is probably the second most productive in terms of fish, after the Humboldt.

This productive system supports rich and diversified fisheries, which consist of a number of commercially valuable species. Most important among these is the Cape hake, which comprises two species, shallow water hake (*Merluccius capensis*) and deepwater hake (*M. paradoxus*), which are caught in bottom trawls. The former is found from the coast to depths of about 380 m and the latter from about 150 m to 800 m depth. Larger individuals of both species occur at greater depths than smaller fish and there is little overlap in the distribution of mature fish. Two other trawled fish of commercial importance are the monkfish (*Lophius vomerinus*) and the orange roughy (*Hoplostethus atlanticus*). The monkfish, which occurs in highest densities at depths of 300 to 400 m off central Namibia, became of importance in the 1980s. The orange roughy is a deep water species which is found on the outer Namibian shelf at depths of 600 – 1 000 m, mainly over hard substrata in a few small areas and the fishery was only developed in the 1990s and has now been closed.

In addition, there is a large stock of Cape horse mackerel (*Trachurus capensis*) in northern Namibia and the adults are targeted by midwater trawlers; this is the largest fishery by volume in Namibia. Small pelagic fish which tend to form dense shoals near the surface, such as sardine (pilchard, *Sardinops sagax*) and Cape anchovy (*Engraulis capensis*) are taken in purse seine nets. Small juvenile horse mackerel tend to form mixed shoals with sardine and anchovy and these are also caught in purse seine nets. Two other small but valuable fisheries are for West Coast rock lobster (*Jasus lalandii*) and deep-sea red crab (*Chaceon maritae*). Rock lobster is found along the west coast from east of Cape Point to approximately 25^{o}S (about 180 km north of Luderitz). In Namibia they are harvested commercially in the Lüderitz area using traps in waters deeper than about 10 m. Red crab occur on the slope of the continental shelf from about 27^{o}S in Namibia, stretching northwards to Angola, at depths of about 300 – 900 m.

An important top predator in the Benguela system is the Cape fur seal (*Arctocephalus pusillus pusillus*) which is abundant and breeds at 15 island and mainland colonies scattered along the Namibian coast as far north as Cape Frio. Seals have been harvested for centuries for meat, skins and oil, dating back to the days of itinerant sailing vessels in the 17th century. There is currently an annual harvest of seal pups and adult bulls at Cape Cross and at Wolf/Atlas Bay near Luderitz. Although the value of this harvest is low, seals are mentioned here because they are a top predator in the system and their dynamics were strongly affected by a severe depletion in their prey resources (mainly pelagic fish) in the mid-1990s, which resulted in the death by starvation of thousands of pups. Thus they may be important visible indicators of environmental change.

2 History of exploitation

At independence in 1990 Namibia inherited severely depleted and over-exploited fisheries, in which all the above stocks were in decline and were far below their pristine levels. Hence the industry as a whole could not deliver its potential contribution to the national economy, nor supply enough jobs to reduce the numbers of unemployed workers. There are many reasons for this situation, as will be outlined below. One of the prime aims of the new administration in Namibia has been to rebuild the fish stocks, and to this end strict controls were enforced, both in the number of vessels licensed to fish and in total allowable catches (TACs).

3 West Coast Rock lobster

There was very little exploitation of fish before the Second World War, but the first rock lobster canneries had been built at Lüderitz as early as the 1920s. These struggled through the depression years of the 1930s until the end of the war, when two events transformed the market. Firstly, in 1946 the two leading United States shipping lines on the South African route agreed to install deep freeze compartments on all new vessels, making possible the export of frozen lobster tails. The following year the South African producers imposed a monopoly marketing organisation (SAFROC) on all quota holders, and in 1949 the Lüderitz producers formed an affiliated body (SWAFROC). These organisations rapidly opened up the wealthy US market and soon the US demand outstripped the Namibian production. This in turn led to an increase in prices and the incentive to harvest more lobsters, since an export quota was now a guarantee of high profits. By the mid 1950s the Lüderitz canneries had converted almost completely to frozen tails and mergers and takeovers had reduced the number of producers to two – Sea Products (part of the Oceana group) and SWA Fishing Industries (SWAFIL). The catch of lobsters steadily increased and began to overtax the stock. The situation was made worse when, in 1964, a third large quota was allocated to Angra Pequena (later Blue Angra), a subsidiary of Kaap-Kunene.

This raised the overall quota of lobster whole weight to about 8 300 tonnes. This quota was caught in 1965 and exceeded in 1966 when about 8 800 tonnes were harvested, which was the peak of the industry. However, the catch fell sharply in 1967 to about 5 500 tonnes and then, in 1968, the authorities compounded a bad situation by abolishing the minimum size restriction in response to strong pressure from the companies, who feared the impact of the falling volume of landings on their profits. A subsequent scientific analysis concluded that the abolition of

minimum size limits was a further setback to the population after the intensive exploitation following the increased quota of 1964.

Catches increased again and exceeded the quota in 1968-19 69. In 1970 a minimum size was re-imposed and in 1971 the quota was cut by 45%. Again catches fell sharply, this time to around 2 200 tonnes in 1971 (Fig. 1). But it was too late to save the industry. There was a brief revival in 1973-1974 when catches rebounded to about 3 000 tonnes, but thereafter they declined to an average of about 1 500 tonnes until 1990, when they declined still further to a few hundred tonnes. From 1998 to 2005 the catches lay between 214 and 365 tonnes (Table 1), which illustrates the complete collapse of the fishery from its high point in 1966. By 1974 the three factories had pooled their operations under one roof (Sea Products) and employment had been halved to about 600 workers and 600 fishermen. During the 1990s a commercial fleet of about 20 vessels took part in lobster fishing activities; this figure had risen to 29 vessels in 2009 (Table 9).

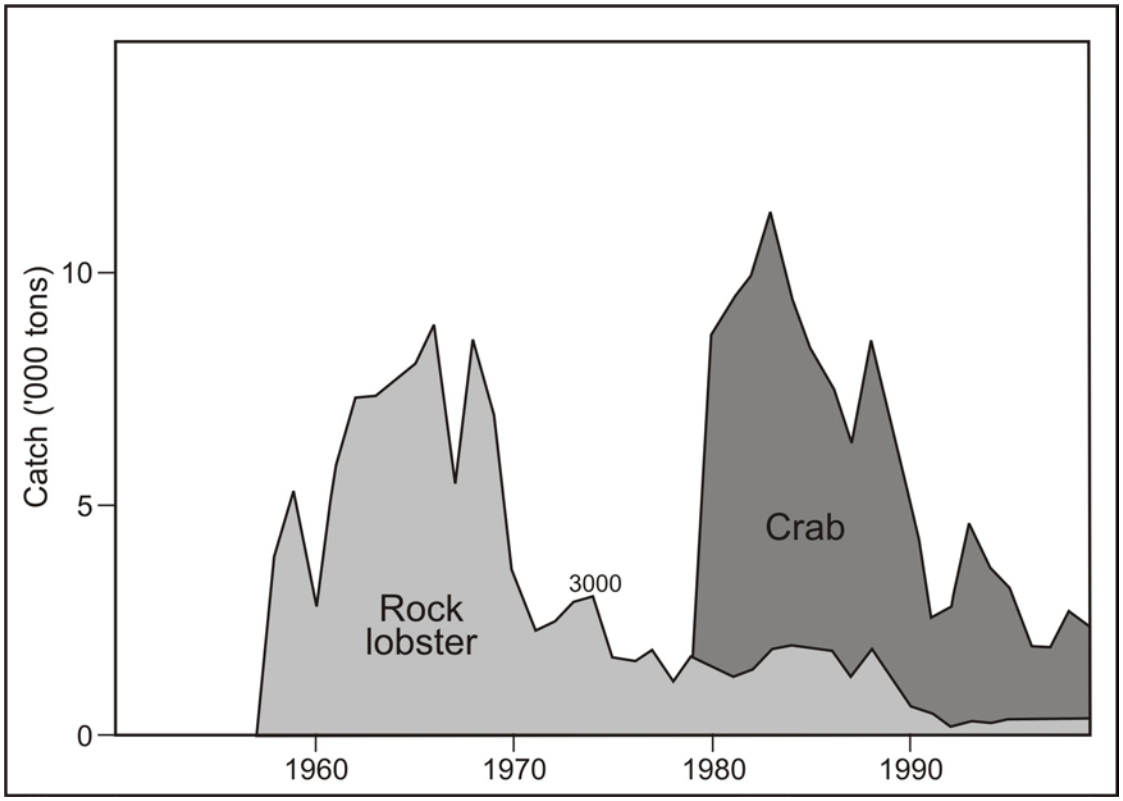

Figure 1: Catches of rock lobster since 1958 and deep sea red crab since 1979 off Namibia

Table 1 Catches (t) of rock lobster off Namibia 1998 to 2005

Year	1998	1999	2000	2001	2002	2003	2004	2005
Catch	350	304	365	363	358	250	214	248

4 Deep-sea red crab

The red crab fishery began in the mid-1970s when it was an open resource targeted by foreign vessels. By 1974 17 vessels were fishing for crab and catches rose to a peak of about 10 000 tonnes in 1983 (Fig. 1). Landed catches during the 1980s averaged 7 000 – 9 000 tonnes, but fell to below 3 000 tonnes in 1991 and remained at that level, clearly as a result of over-exploitation of the stock. Catch limits were introduced in 1989. From 1998 to 2005 catches were fairly stable at a little above 2 000 tonnes (Table 2). Currently the resource is caught by only three licensed vessels using Japanese beehive traps and the entire catch is exported to Japan.

Table 2 Catches (t) of the deep-sea red crab off Namibia 1998 to 2005

Year	1998	1999	2000	2001	2002	2003	2004	2005
Catch	2283	2074	2700	2343	2471	2128	2467	2413

5 The pelagic fishery for sardines

The background to the development of the pelagic industry in South Africa and Namibia lies with the collapse of the Californian sardine industry from 1946 to 1952. In the mid 1940s canneries and fishmeal plants began to develop in the Cape with funding supplied by the state owned Fisheries Development Corporation. Due to the collapse of the Californian sardine, the US corporations had redundant machinery to sell and established markets to supply. They therefore supplied technicians, the bulk of the plant and large purchase contracts to South Africa.

Early success in South Africa led to the start of the pelagic industry in 1947 in Namibia and the accompanying demand for factory licences, so that by 1953 six had been awarded to five companies – namely SWAFIL, Ovenstones, Sea Products SWA, Kaap-Kunene and Marine Products. By 1954 six large factories were built along the Walvis Bay waterfront housing fishmeal reduction plants and five also containing canneries. As a result of all this activity, 100 small boats converted from line fishing to purse seining, fishing crews rose from a few to around 600-700 and factory employment from under 100 to about 2 500. The sardine (pilchard) catch rocketed from 1 000 tonnes in1948 to 262 000 tonnes in 1953 and for a brief period Walvis Bay was a boom town.

However, the Namibian (or SWA as it was at the time) administration had enacted a comprehensive enabling law in 1949, the Sealing and Fisheries Ordinance. With the recent and very severe warning of the Californian collapse, the Administration adopted a very conservative policy. There was no scientific advice whatever and no idea of the size of the sardine stock, so its decisions could only be arbitrary. Nevertheless, during 1952–1954 it imposed a series of controls, in particular banning any further expansion in the number or capacity of the factories, setting individual quotas for each factory limiting the intake of raw fish and pegging the number and gross tonnage of the fishing boats supplying the factories. In effect this meant a TAC of 227 000 tonnes, which was a level set at one third of the peak Californian sardine catch in 1936.

For the remainder of the 1950s the quota was held down. Thus restricted, the companies maximized their profits by improving efficiency. The fleet of purse seiners was thinned out and organized in a catching programme that would supply a regular flow of fish. Meanwhile, the

factories concentrated on canned sardines, which had three times the value of fishmeal. Over the same period technical improvements raised the yield of body oil and of fishmeal and, as the labour intensive canning lines increased their output, factory employment rose to around 4 000.

But the companies were unhappy and chafed at the restrictions. Their quotas were often filled within 6 to 7 months, leaving their expensive machinery idle. In 1953 the Walvis Bay factory managers formed the Fish Factories Executive Committee to represent their interests with the Administration and when, in 1959, the respected official in charge of fishing policy retired, they began to apply pressure to have their quotas increased. From that point rational control of the fishing industry began to crumble in the face of company pressure. Within five years (1960–1964) the overall quota was nearly trebled in a series of annual steps, each described as 'temporary' and in addition the companies were granted mid-season quota increases in 1959 and 1963. Besides all this, in 1961 they won a substantial increase in the permitted factory processing capacity, as well as permission to open the sixth cannery in Walvis Bay, and in 1964 they opened two new fishmeal plants, one at Walvis Bay and one at Luderitz. Yet, despite these concessions, in 1966 the companies were able to complain that the quota was restricting them to only 60% of their operating capacity.

6 The era of the factory ships

As though the above mentioned trebling of the quota were not enough of a threat to the stock, in 1966 there emerged an even greater danger in the form of factory ships. At that time the modern concept of a 200 nm exclusive economic zone (EEZ) was not in existence and the standard EEZ was only 3 nm. In 1963 South Africa enacted the Territorial Waters Act which decreed an extension of South African and Namibian territorial waters to 6 nm, with an additional 6 nm set as an EEZ – making 12 nm or 22 km in total.

For some time several South African fishing companies had been trying to persuade the South African government to license factory ships to operate out of Cape Town, which would be able to bypass altogether the conservation measures of the Namibian administration, which had jurisdiction only within the 22 km coastal limit. The first licence was issued in 1965 to the Silverman group, and their factory ship the *Willem Barendsz* began operating outside the Namibian coastal limit in late 1966. She was joined a year later by the *Suiderkruis* owned by Kaap-Kunene/Ovenstone. Each ship had its own flotilla of purse seine catchers and they were the largest ships of their kind afloat, having nearly double the capacity of a fishmeal plant on shore.

The result of the deployment of these vessels was to bring the Namibian administration into open conflict with the South African Department of Industries and the ships were barred from being serviced at any Namibian port. The Fishing Industry Commission described the likely impact of the ships as 'extremely dangerous' and its chairman accused them of 'sheer piracy'. Having failed to get the factory ship licences withdrawn, the Namibian administration embarked on a political and economic offensive and abandoned all measures aimed at conserving the stock. Their policy now became to catch their fair share of the resource before the factory ships destroyed it completely. Therefore, they allocated supplementary quotas to the established factories, gave a new large quota to the Sarusas Development Corporation and in 1968 allocated another new quota to local trawler interests (Consortium).

The results of this uncontrolled assault on the stock were predictable and 1968 marked the nadir in the fortunes of the sardine, since the stock size of the resource, once estimated to have been more than 10 million tonnes, fell to just a few thousand tonnes by the early 1980s. The two factory ships reported a catch of 558 000 tonnes of sardines and the shore factories a massive 829 000 tonnes, making a total haul of 1.387 million tonnes in 1968, which was the peak catch of all-time (Fig. 2). The negative effects of this huge catch on the stock were exacerbated by the fact that, during the 1970s, the companies were evading quotas by carrying out large scale dumping of catches at sea. Also, for the first time 12.5 mm anchovy nets were allowed in addition to the 28 mm sardine net, and anchovy constituted about 15% of shore landings. Because anchovy and juvenile sardines shoal together it was inevitable that many juvenile sardines were caught as well.

Despite mounting evidence that the sardine was in a state of collapse, the authorities were slow to act. In April 1968 the South African government took over direct responsibility for the Namibian fishery and for the first time put quotas on the factory ships, but at levels that were far too generous. In 1970 the ships were banned at last and yet, for some inexplicable reason, the *Willem Barendsz* was allowed to return the next year, when it was only able to catch 56 000 tonnes. At this time the Sarusas quota was also withdrawn.

But by now it was far too late to save the stock. In 1970 the sardine landings had slumped by 40% over the previous two years and the first surveys of an emergency research programme showed that the sardine biomass had been reduced by about 75% over the previous three years. This alarming finding prompted some response from the authorities who restricted the sardine quota for 1971 to 271 000 tonnes and for the first time ever the inshore fleet caught more anchovy and horse mackerel than sardines.

At this point nature took an unfortunate hand in the further decline of the stock by providing favourable environmental conditions for a strong year class to recruit to the adult stock in 1972 and during 1972 to 1974 the adult biomass doubled. And this was enough to convince the companies, naively optimistic as ever, that the 1970-1971 crisis was just a temporary aberration. Scientific arguments for caution and more comprehensive research were ignored and the quota was raised once again, so that by 1974 it had doubled to 560 000 tonnes.

During the previous decade of prosperity the economic power of the fishing industry had been rising steadily and by 1975 strong export prices had encouraged canning (since canned sardines were a far more valuable product than fishmeal) to an all-time peak production of 10.8 m cartons in that year. The combined value of the canneries, fishmeal and fish oil was about R100 m at 1975 prices, which contributed about 10% of GDP and 15% of exports. Thus, the pelagic fishing industry had become a major player in the national economy and it was the second largest industrial employer after mining. The fishing fleet was still around 100 boats, the number of fishermen was close to 850 and the boom in canning had the factory labour force to around 7 500 at its seasonal peak, plus another 500 in related employment.

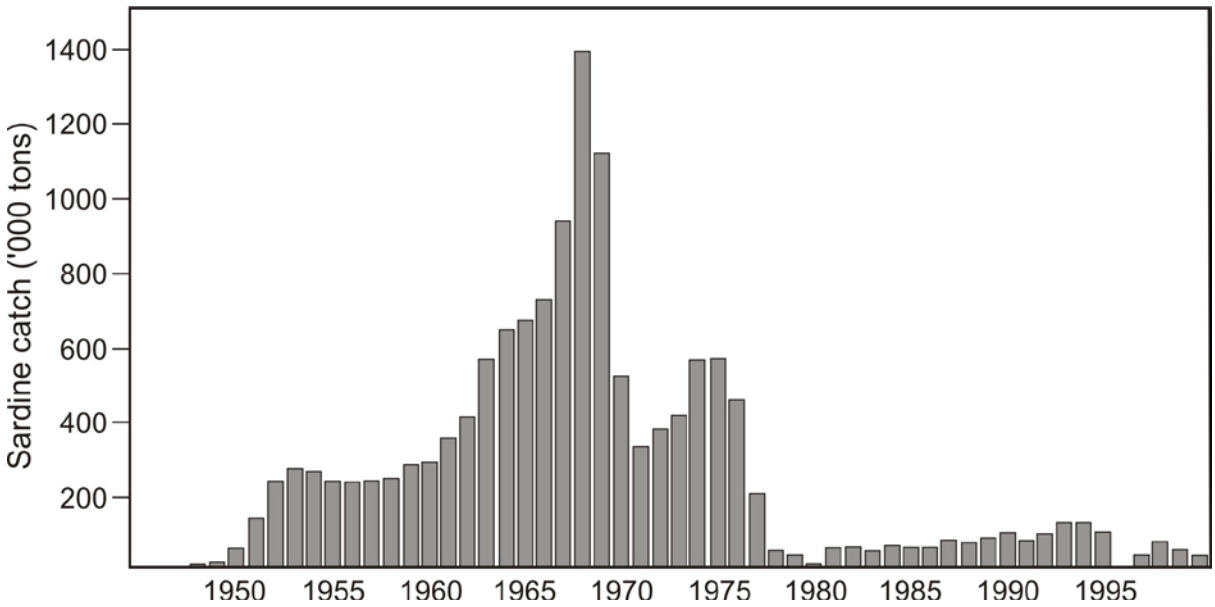

Figure 2: Catches of of sardine from the Namibian part of the northern Benguela since 1947

7 The final collapse (1976-1983 and 1983-2006)

Unfortunately, however, this situation of prosperity and economic power was not set to last, because the canning boom was founded on the illusion that the sardine stock would continue to recover at the same rate as from 1972-1974. In reality, the recovery was exceedingly fragile and during 1975-1976 the environmental conditions turned from good to poor, so that very small numbers of juveniles recruited to the adult stock. In addition, the scientific stock surveys were halted, so that neither scientists nor factory managers had the vital information they needed to make the right decisions. During those two crucial years most of the remaining adult sardines were caught and by mid-1976 the absence of sardines was obvious. An emergency scientific survey was conducted in early 1977, but found so few shoals that the population size could not even be estimated. Yet, even then, after receiving such devastating information, the authorities did not close the fishery – they merely cut the sardine quota to 200 000 tonnes (which was not quite filled). The next year, 1977, the season was abruptly closed after only 46 000 tonnes were caught in three and a half months.

In 1978 the authority for fishery management was returned to Namibia and radical action was taken at last. In 1979-1980 only small canning quotas were allowed and in 1981 canning was temporarily banned. For 1982 and 1983 the quota was set at 30 000 tonnes, despite a scientific recommendation of only 20 000 tonnes. For the industry on shore the collapse was calamitous. Fishmeal and oil output fell by more than half and canned sardines virtually disappeared at one stage. In 1982 and 1983 cannery production rose to 1.5 million cartons (the peak was 10.8 million), which was only made possible because new refrigerated purse seiners landed their catch in much better condition and so allowed nearly twice as many cans to be filled from the same quantity of fish. Nevertheless, by the end of 1982 only three canneries were still operational and much of the machinery was being cannibalised for spares. The closure of the labour intensive canning lines was a crippling blow for the workforce and for the fishermen. By 1981, the purse seine fleet had been halved to 45-50 boats and the number of active fishermen to 400; by 1982-

1983 total employment in fishing and fish processing had fallen to around 2 500. Thus, some 8 000 jobs had been lost in five years.

At Independence in 1990 the stated aim of the Namibian authorities was to rebuild depleted fishery stocks as close as possible to their pristine levels. Sadly, in the case of the sardine this has not happened. A glance at Figure 2 shows that catches remained very low throughout the 1980s. The highest TAC since 1990 was set at 125 000 tonnes in 1994, but since then they have fallen again. In 1996 only 1100 tonnes were caught, in 2002 only 4 300 tonnes and in 2006 only 2 100 tonnes. The annual catches from 1998 to 2006 are shown in Table 3. In addition to the low catch rates, another relevant factor is that the mean fish size has remained low and is significantly lower than the pre-1960 pristine size. The status of the Namibian sardine stock remains critical and an annual TAC continues to be set primarily to try to sustain employment and factory production. Currently only 14 purse seiners are licensed, of which ten were active in 2009. This fleet of vessels targets juvenile horse mackerel during the first half of the year, moving on to sardines only when the quota is allocated later in the season.

Table 3 Commercial landings of sardines (t) in Namibia 1998 – 2006

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006
Catch	64500	42800	26500	10700	4300	21000	28400	25200	2100

Whether the Namibian sardine population will be able to rebuild to historical levels is unclear. Some changes in the system suggest that a regime shift may have occurred. For example, horse mackerel and anchovy, rarely seen in the 1960s, suddenly became abundant in the 1970s. If the sardine stock is to recover to anything like its former levels of abundance, managers must strive to promote a healthy spawning stock, composed of a number of age classes widely spread throughout the region. Only then and only providing environmental conditions are favourable, are recruitment levels likely to be sufficient to support a strong sardine fishing sector once again.

8 The hake demersal trawl fishery

The hake resource is the most valuable commercially exploited fish resource in Namibia in terms of its contribution to GDP and is second in volume to horse mackerel. The fishery began in the early 1960s using methods of deep sea trawling with both freezer and wetfish trawlers; hake are also caught by longline vessels. Because the United Nations revoked South Africa's old League of Nations mandate to rule Namibia in 1966, the attempt by South Africa to enforce an EEZ for Namibia was regarded as illegal by foreign fleets. Consequently, the trawlers from foreign nations were free to fish in Namibian waters at will and from the mid-1960s the trawlers from nine nations, but mainly from Spain and Soviet Russia, were very active. The fishery was effectively an open access fishery and catches increased rapidly from under 50 000 tonnes in the early 1960s to over 800 000 tonnes in 1972, which was the all time peak catch (Figure 3).

After 1972 the catches began to fall rapidly, and as there was no management authority there was no attempt at conservation of the stock, and no incentive for any particular nation to put in place conservation measures, if they were the only ones doing it. It was the well known situation of 'the tragedy of the commons', where an open resource is plundered by everybody and conserved by nobody. Therefore, to reduce the likely negative effects of a multinational fishery

with no controls, the International Commission for the South-East Atlantic Fisheries (ICSEAF) was formed in 1969, but only held its first working session in April 1972. ICSEAF provided advice on the management of hake and other commercially important stocks until 1989, the year before Namibian independence in 1990. In particular, it implemented a minimum mesh size of 110 mm for hake in 1975 and member country quotas in 1976, as well as a closed 25 km coastal zone to protect hake and sardine inshore breeding areas. The catches fell to a low of about 170 000 tonnes in 1980, but then increased between 1981 and 1989, mainly as a result of improved recruitment with especially strong year classes in 1982 and 1983.

At the time of Namibian Independence all the commercial fisheries were heavily depleted and overfished. The Administration, therefore, took immediate steps to ban fishing by all foreign vessels and to declare a 200 nm EEZ. At first illegal fishing continued because Namibia had no means of enforcing the EEZ, but in March 1991 action was taken against the Spanish fleet and three vessels were detained, which put an end to illegal fishing. In December of that year the Government set out its fisheries policies and these were translated into law via the Sea Fisheries Act of 1992. Strict conservation measures were introduced and the TAC was set low, so that initially catches were only 55 000 tonnes per year. Catches were then allowed to grow to 87 000 tonnes in 1992 and to 160 000 tonnes by 1999. It is noteworthy that in several years the TAC was not filled (Figure 3). The hake landings from 2000 to 2004 were fairly consistent at around 150 000 to 165 000 tonnes, but then fell sharply in 2005 and 2006 to only 73 000 tonnes (Table 4), which may reflect the fragile nature of the recovery of the stock. The most recent management measures include the prohibition on trawling at depths shallower than 200 m to protect juveniles and spawning adults. In 2006, due to stock uncertainty, a closed season was introduced for the month of October and the minimum permitted trawling depth was increased to 300 m south of 25°S. All vessels must also be fitted with Automatic Location Communicators.

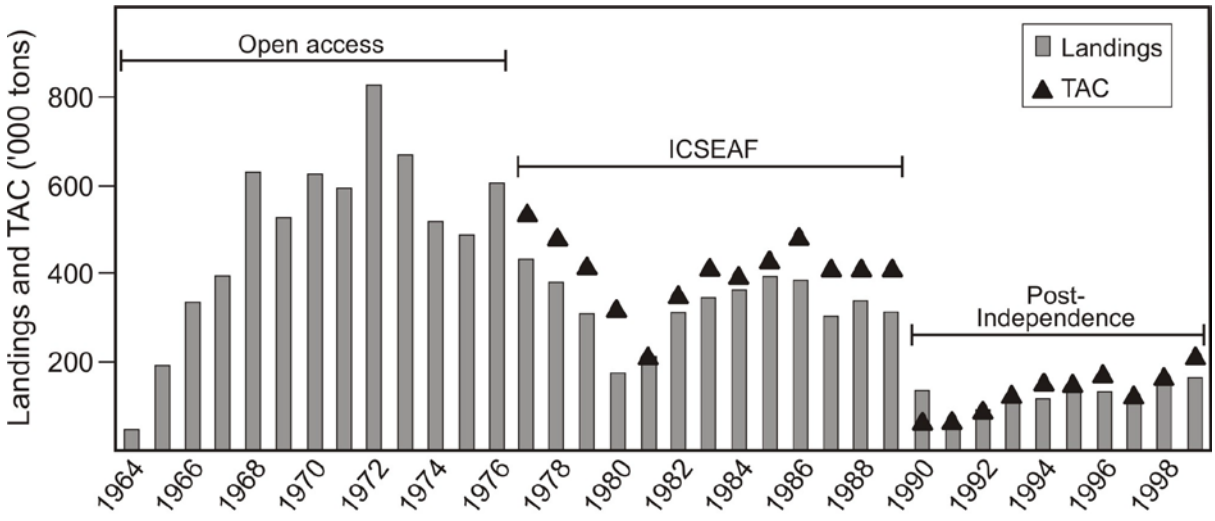

Figure 3: Landings of Cape hake off Namibia 1964 – 1999 and TACs set 1977 – 1999

Table 4 Landings of Cape hake (t) in Namibia 2000 – 2006

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006
Catch	145000	167000	151000	165000	156000	165000	164000	132000	73000

The Sea Fisheries Act of 1992 had a major impact on the development of the hake industry, because it ensured that it would contribute as much as possible to the production of value-added products and would create jobs for Namibians on land as well as at sea. With these aims in mind the Namibian Ministry of Fisheries and Marine Resources (MFMR) put in place a policy that reserved an increasing proportion of the TAC to vessels landing their fish wet on ice, rather than frozen. The structure of the fleet therefore changed from 1992 as the number of wetfish vessels increased. The increasing percentages of the TAC allocated to wetfish vessels were as follows: 20% in 1993, 40% in 1994, 60% in 1995 and 80% in 2006. Up to 120 trawlers and 20 longliners fished the hake resource at the peak, but these numbers have fallen as the TAC has been reduced – there were 71 trawlers and 18 longliners in 2009 (Table 9) . Other developments since 1990 have been the increase in the number of hake processing plants from six (four in Walvis Bay and two in Luderitz) in 1990 to 11 in 1999 (eight in Walvis Bay and three in Luderitz).

As mentioned, one of the aims of the 1992 Act was to maximize job creation for Namibians and today the hake fishery is the major employer in the fishing sector. Employment in the hake fishery, as a percentage of employment in fishing, increased from about 3% in 1990 to 60% in 1999 and by 2000 there were about 4 500 workers on shore and 2 500 based at sea. The contribution of the sector to GDP was only 1.7% in 1990, but had increased to over 10% by 1999.

At Independence the stated aim was to rebuild the hake to a biomass level of not less than one million tonnes of exploitable stock. And research to measure the total hake biomass has been ongoing by means of swept-area trawl surveys and acoustic surveys. This research has shown that Namibia inherited a hake biomass estimated at only about 500 000 tonnes, which increased to about 800 000 tonnes in 1992, but then declined again to the 1990 level by 1997. Uncertainties in the true level of the hake biomass have caused uncertainties in management. The research surveys of 2000 showed a biomass of 1.2 million tonnes, which led to the stable catches of 2000 to 2004, but the decline in catches thereafter is a worrying factor which calls in question the robustness of the recovery of the stock.

9 The monkfish

The earliest catch records supplied by ICSEAF, when it was an open resource fishery, date back to 1974, when monkfish were taken as bycatch in the hake fishery. Catches rose to about 14 000 tonnes in 1981 and 1982, before declining to about 6 000 tonnes in 1989. Following Independence the fishery has developed into a targeted one, in addition to the bycatch from the hake fishery, in response to increasing market demand and escalating value. Since 1991, annual catches by small freezer trawlers rose from about 1 500 tonnes to a peak of 16 000 tonnes in 1998. Thereafter, from 1999 – 2006 catches stabilized at between 9 000 and about 14 000 tonnes (Table 5). The value of the product is high, most of which is exported to Europe, so the fishery is an important contributor to the Namibian economy.

Table 5 Catches (t) of monkfish in Namibia 1998 – 2006

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006
Catch	16429	12967	14255	12251	14933	13023	8952	10412	9812

The orange roughy

Exploratory fishing for orange roughy began in Namibia in 1994. Small catches were made in 1995 and in the following three years catches of 17 000, 14 000 and 10 000 tonnes were made, which caused much optimism as it came at a time when Namibia's other marine resources were in decline. However, by 1998 landings had declined and in 1999 and 2000 only about 2 000 tonnes per year were caught. Since then catches have declined further, with only a few hundred tonnes being caught in 2005 and 2006 (Table 6). The product is high value and high quality fillets are exported to the USA and Japan. This fishery has now been closed.

Table 6 Catches (t) of orange roughy in Namibia 1996 – 2006

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Catch	17381	14729	10040	2699	1344	874	1985	1731	1131	360	429

10 The anchovy and juvenile horse mackerel pelagic fishery

Very little anchovy was caught in Namibia prior to the 1968 peak in the sardine catch. Following the subsequent decline in the sardine stock, anchovy began to appear in the purse seine catches, initially in small quantities, but from the mid-1970s to mid-1980s at levels of 200 000 to 350 000 tonnes. There was a pronounced peak catch of about 360 000 tonnes in 1987, following which catches declined to about 50 000 tonnes in the early 1990s and to zero by the mid-1990s. Surveys conducted in the late 1990s indicated that the anchovy stock was severely depleted. Catches continued at virtually zero up to 2006 with the exception of 2002, when a little over 40 000 tonnes were caught.

The first catches of juvenile horse mackerel by purse seiners were only recorded in 1971 after the first collapse of the sardine stock, thus following a similar pattern to the anchovy catches. The initial catch was 140 000 tonnes, but after that it declined to an average of 59 000 tonnes per year with a maximum of 116 000 tonnes in 1992. By the late 1990s the catch was down to about 20 000 tonnes. Both anchovy and horse mackerel are utilized entirely for fishmeal and oil.

11 The horse mackerel midwater trawl fishery

Adult horse mackerel are targeted by midwater trawlers and this is the largest fishery by volume in Namibia. Catches began in the late 1960s at levels below 50 000 tonnes p.a. and rose gradually to around 500 000 tonnes p.a. between 1978 and 1987. As we have already seen, prior to 1990 this was an open fishery, so that most of the catch was taken by foreign vessels. Following Independence when Namibia took control of the fishery, a minimum mesh size of 60 mm was introduced and the midwater trawl industry was not permitted to fish at depths shallower than 200 m. Initially, catches fluctuated around 350 000 tonnes prior to 1998. From 1998 to 2002 catches dipped slightly to 300 000 – 350 000 tonnes and fell further in 2003 and 2004 when small catches were taken (Table 7). In 2006 the catch was only 124 000 tonnes which correlated with reduced stock biomass estimates derived from acoustic research surveys in 2006 and 2007, which showed a decline in biomass from above 1.5 m tonnes to only about 500 000 tonnes.

Table 7 Catches (t) of adult horse mackerel in Namibia 1998 – 2006

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006
Catch	311000	321000	357000	322000	358000	36000	29000	312000	124000

12 Seals

The Namibian seal harvest is controlled through an annual TAC, with separate quotas for pups and bulls. The harvest is seasonal, with pups harvested for their skins and oil from July to September and bulls for the dried genitalia in November. The activity offers only limited seasonal employment. TAC recommendations are based on annual aerial censuses and estimates of biological parameters for the population. The recommended seal TAC since Independence has varied between 28 000 in 1991 and 70 000 in 2004 (pups and bulls combined), but was only fully harvested in 1995 and 1996. Pups contribute 80-90% of the catch in all years. Table 8 shows the individual catches of pups and bulls from 1998 to 2004.

Table 8 Harvests of Cape fur seals in Namibia 1998 – 2004

Harvest	1998	1999	2000	2001	2002	2003	2004
Pups	24446	20550	38054	39926	35082	29577	54496
Bulls	4983	4030	3605	4202	4496	4005	4911
Total	29429	24580	41659	44128	39578	33582	59407
TAC	40000	35000	67000	65000	65000	65000	70000

13 Summary

The fisheries are the third largest sector of the Namibian economy, after agriculture and mining. The sector has generated more than 10% of GDP since 1998 and it is the second largest export earner after mining, with export value about six times greater than at Independence. It is also the second fastest growing industry after tourism. Local employment in the sector grew rapidly after Independence and the number of people directly employed in fisheries in 1998 was about 15 000 of which 7 500 were fishers. The numbers of vessels employed in the Namibian fisheries is shown in Table 9.

Table 9 Numbers of vessels licensed to operate in the Namibian commercial fisheries

Fishery	2005	2006	2007	2008	2009
Small pelagic	17	16	9	11	10
Demersal Trawlers	121	78	87	91	71
Longliners	28	39	30	18	18
Midwater	15	10	13	10	9
Deepwater	4	4	2	0	0
Large pelagic	52	65	67	88	48
Linefish	16	15	15	15	15
Crab	2	2	2	3	3
Rock lobster	28	18	32	31	29
Monk	25	22	20	25	16
Total	308	269	277	292	219

The demersal fishery is the most valuable and in 1996 had a landed value of about N$600 m and a final value after product enhancement of N$720 m; about 60% is processed ashore compared with only 6% in 1992. About 90% of the catch is hake and the remainder is monkfish with an average landed value of over N$100 m p.a. Almost the entire demersal catch is exported.

The pelagic fishery is the second most valuable, with canned sardines the most valuable product - making up more than 90% of the export earnings. During the 1990s the annual export earnings were about N$400 m, but the decline in catches of sardines in the 2000s would have caused this figure to fall.

The third industry is the mid-water trawl fishery for horse mackerel, which contributes about N$250 m p.a. in export earnings in recent years, mostly in the form of low value frozen fish. There is little product enhancement and the export value is only about 10% above the landed value. About 3% of production is consumed by Namibians domestically.

The fourth industry is the deep water fishery for orange roughy, which made a significant contribution in the 1990s of about N$170 m in export earnings. However, recent low catches would have reduced this figure significantly. The above four industries normally contribute over 90% of product value, with additional small contributions from the tuna (3%), crab (1.5%) and rock lobster (1.5%) fisheries. The total processed value of the major industrial fisheries in 1999 was estimated at N$2340 m.

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