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# The value of Namibia's commercial fisheries

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**Table of Contents**



**List of Figures, Tables and Boxes**



**Acronyms**

| | |
|---|---|
| EEZ | exclusive economic zone |
| GDP | gross domestic product |
| ITQ | individual tradable quota |
| MFMR | Ministry of Fisheries and Marine Resources |
| SEEA | System of Integrated Environmental and Economic Accounting |
| TACs | total allowable catches |

**Abstract**

*Namibia has one of the world's richest fisheries and its post-Independence fisheries policy stands out as a model in many respects. Struggling to recover from severe overexploitation prior to 1990, Namibia has achieved a remarkable transformation of the industry in a relatively short time. Fish stocks have mostly stabilised, and a strong domestic fishing industry has developed that not only operates without subsidies, but actually pays part of the resource rent to government. This last point is quite striking because of the global trend for massive government subsidies for the fishing industry in most countries.*

*Proper management of fishery assets is very important for the sustainability of Namibia's economy. The environmental and natural resource accounts provide a tool to assess the economic value of stocks, economic losses incurred through over-exploitation and depletion of stocks, and the potential value of the stock under different management regimes. Physical and monetary accounts for Namibia's three major commercial fisheries—pilchard, hake, and horse mackerel—are constructed and discussed here using the United Nation's System for Integrated Environmental and Economic Accounts.*

*In constant 1995 prices, the asset value of fish stocks increased by 37 per cent in the 1990s, from $N2,323 million to $N3,384 million, reflecting the specific growth of hake stock and the general increased economic value of all stock. The quota levies on fish generate significant government revenues, although as a share of rent, they appear to have declined from around 50 per cent in 1991 to around 20 per cent in 2000. This suggests that much of the resource rent accrues to the private sector rather than the government. Whether this situation is economically efficient or not is unclear. The fishing sector as a whole has grown since Independence, but growth has not been uniform and much of the growth is attributable to hake. The importance of fishing to Namibia's economy calls for continued careful management so that fishing can provide income and employment for future generations.*

## 1. INTRODUCTION TO NAMIBIA'S FISHERIES

The world fish catch has roughly tripled over the past few decades from 40 million metric tons in 1961 to just under 120 million tons in 1998 (FAO, 2001). This rapid increase in fish production has put enormous pressure on the world's fish stocks and the majority of fisheries are exploited either at or beyond sustainable levels. In addition, much of the world's fishing industry is heavily subsidised, with subsidies estimated at $US54 billion in 1989 (FAO, 1993). In a global context, Namibia's fisheries policy stands out as a model in many respects. Struggling to recover from severe overexploitation prior to Independence in 1990, Namibia has developed a strong domestic fishing industry that not only operates without subsidies, but actually pays part of the resource rent to government.

Namibia's fishery is one of the richest in the world, based on a productive eastern ocean boundary upwelling system, the Benguela ecosystem. The commercial fisheries are dominated by three species: hake (*Merluccius capensis* and *Merluccius paradoxus)*, horse mackerel (*Trachurus capensis*) and pilchard (*Sardinops ocellatus*). Prior to Independence in 1990, Namibia was ruled by South Africa and exercised some control over the inshore fisheries. However, there was little control over the more lucrative offshore fisheries because no country would acknowledge South Africa's jurisdiction over Namibia's 200-mile Exclusive Economic Zone (EEZ). In effect, most of Namibia's fisheries operated as an open-access resource, and consequently, fish stocks were severely depleted (Figure 1). With no recognized EEZ, the offshore fisheries were dominated by foreign fleets, mainly those of Spain, South Africa and the former USSR; relatively little economic benefit accrued to Namibia.

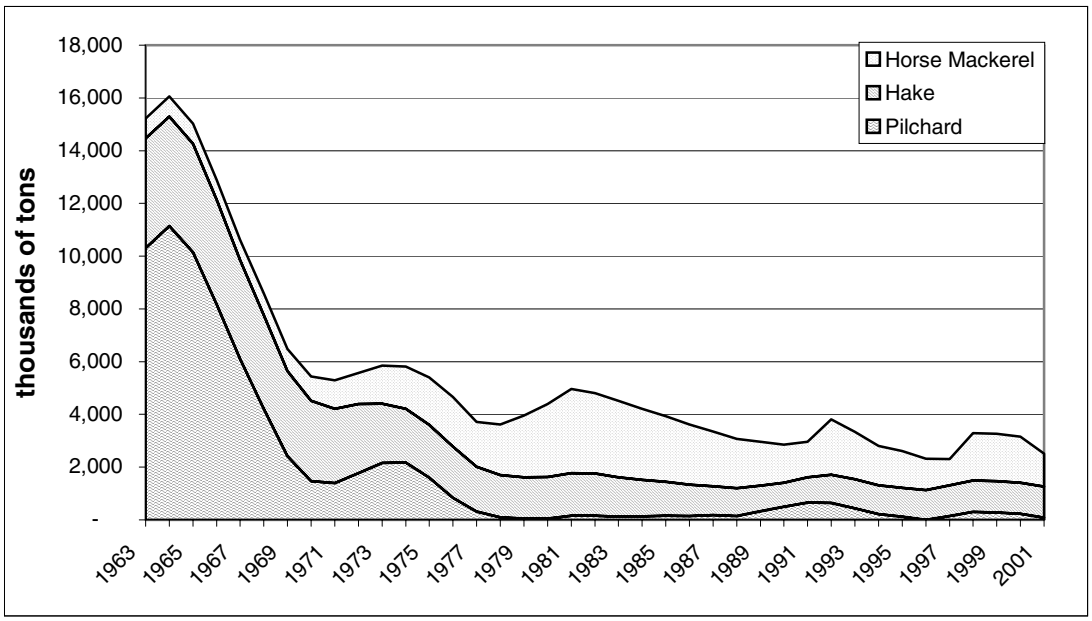
After Independence, Namibia established control over the 200-mile EEZ and a new fisheries policy was introduced. This policy had two basic objectives:

1. to ensure ecologically sustainable management of fisheries;
2. to maximise benefits for Namibians from the fisheries sector, especially those previously excluded from the industry as a result of discriminatory laws and practices...

To ensure sustainability, annual total allowable catches (TACs) are set and strictly enforced for each vulnerable species. To ensure that Namibians benefit economically, quota levies were introduced to recover resource rent (with subsidies for Namibians) and criteria for allocation of rights of exploitation were established that favoured Namibian ownership – especially Namibians previously excluded under the South African regime. Policies also created incentives to establish a fish-processing industry, which has been viewed as a potential source of economic growth.

Under this system, a remarkable transformation of the industry was achieved in a relatively short time. Fish stocks have stabilised and government is hoping to restore the stock to the much higher levels, last seen in the 1960s. Fisheries also increased their economic contribution, accounting for eight per cent of gross domestic product (GDP) and 26 per cent of merchandise exports in 2000 (CBS, 2001a). Employment in the industry in Namibia more than doubled between 1991 and 1998 (MFMR, 2000). The Namibian industry operates without subsidies and has increased its contribution to state revenue dramatically, rising from virtually nothing at Independence to $N103 million (US$15 million) in 2000 (CBS, 2001b). This last point is all the more remarkable because of the global trend for massive government subsidies for the fishing industry in most countries (FAO, 1993; Kaufmann and Green, 1997; Milazzo, 1998).

**Figure 1 Stock of major commercial fish species in Namibia, 1963–2000**




NB: Figures represent fishable, adult biomass. Figures prior to 1990 were estimated using different methods and are not entirely comparable with figures after 1990.
*Source*: Based on Lange and Motinga, 1997; Lange, 2003; MIRC, 2001.

Proper management of fishery assets is very important for the sustainability of Namibia's economy. In the past, the income from harvesting fish would be included in the national income, but changes in the fish stocks were not accounted for. As a result of this practice, the pre-Independence devastation of Namibia's fish stocks appeared to be an economic success story because the economic value of the fish catch was recorded, but not the corresponding depletion of a valuable asset – the fish stock – on which that activity was based. Similarly, the benefits of reducing current levels of fishing to rebuild the stock, which would maintain or increase future levels of catch, would not be recorded. This widely recognized shortcoming of the System of National Accounts has been addressed by the United Nations and other international statistical and economic organisations by the development of a the System for Integrated Environmental and Economic Accounting (SEEA), which provides a framework for accounting for natural capital such as fisheries.

An economic assessment of the value of the fish stock, the economic loss incurred through over-exploitation and depletion of the stock and the potential value of the stock under different management regimes is an essential tool for sustainable management. The environmental and natural resource accounts provide a useful tool for management by recording the value of both fishing activity and fish stocks. Section 2 of this report describes the methodology and data for the construction of fisheries accounts. Section 3 presents the physical and monetary accounts for the three major commercial fisheries: pilchards, hake and horse mackerel. The fourth section discusses the policy implications of the accounts and the light they shed on fisheries management. Concluding remarks are given in Section 5.

## 2. METHODOLOGY AND DATA SOURCES

Fish resource accounts are based on the SEEA (UN, 2002) and a more specialised manual for fisheries that addresses some of the issues unique to compilation of fisheries accounts (FAO and UN, forthcoming). A number of countries have constructed accounts for fish or are planning to do so in the near future (Table 1). The compilation of natural resource accounts for fish presents greater challenges than other resources because fish cannot be directly observed the way forest

resources can, multi-species fisheries are affected by complex predator-prey interactions, there are often large inter-annual variations and fish may migrate out of territorial waters.

**Table 1 Countries compiling accounts for fisheries**

| A. Regular compilation by statistical offices | B. Occasional studies |
|---|---|
| Norway | Iceland |
| Iceland | Philippines |
| Namibia | Korea |
| Canada | |
| United Kingdom | |
| New Zealand* | |
| Indonesia* | |
| Thailand* | |

* countries planning to introduce fisheries accounts.
NB: the list includes only countries for which accounts were constructed within government offices and does not include one-time academic or other studies.

Fish accounts are part of aquatic resources in the SEEA which include freshwater and marine resources, cultivated and non-cultivated. Namibia has important artisanal freshwater fisheries in the northern part of the country, as well as small amounts of cultivated marine resources, such as seaweed and shellfish. However, the most important resources are the marine capture fisheries, mainly hake, pilchard and horse mackerel. Accounts have only been constructed for these three species so far. In future work, other aquatic resources may be included, starting with those that are subject to controls by the Ministry of Fisheries and Marine Resources (MFMR). The recreational fishing sector is important for tourism. However, its estimated value is less than five per cent of the commercial industry (Kirchner et al., 1999; Zeybrandt and Barnes, 2002) so it is not included in the fisheries accounts at this time.

## *2.1 Physical accounts: Methodology and data sources*

Physical stock accounts for fish are constructed for opening stocks, changes that occur during the accounting period (one calendar year) and the closing stock. Changes that occur during the year consist of catch, recruitment, natural mortality, and other volume changes. Other volume changes can include factors such as the migration of fish stock out of the country's territorial waters due to environmental events. In practice, there is not enough information to quantify recruitment, natural mortality and other volume changes, so the changes in the accounts collapse into two categories: catch and other volume changes. While some countries, like Norway, have constructed stock accounts by age class for fish, this is not possible in Namibia. Stocks for hake, pilchards and horse mackerel are estimated every year by the MFMR using virtual population assessment models combined with surveys conducted during the year (Namibia Foundation, 1998).

## *2.2 Monetary accounts: Methodology and data sources*

Monetary accounts are constructed by estimating the value of the physical asset. The value of fish is the net present value of the stream of income it is expected to generate in the future. The stream of income that is attributable solely to the resource is called the resource rent. Constructing monetary accounts has two components: 1) measuring resource rent and 2) making projections about the factors that will affect the future stream of rent. Both components raise unique challenges for fisheries.

### 2.2.1 Measuring resource rent

Rent is defined as the value of production minus the marginal exploitation costs. Where fisheries are managed under an individually tradable quota (ITQ) system such as Iceland or New Zealand, a market for quotas may develop that, under the right circumstances, reflects the rent. Since Namibia does not have an ITQ system, imperfect market conditions exist and the trading prices for quota do not reflect the rent. Where such markets are lacking, rent is often measured with the residual approach explained in Box 1. For the residual approach, Namibia has two sources of data:

1. national accounts, which provide information for the entire fisheries sector since 1980 as well as detailed statistics for each fishery since 1990;
2. annual survey of fishing companies, which provides information about income, revenue, assets and catch for each company in from 1995.

The chief advantage of the national accounts is that it is comprehensive, covering all fisheries and all years, although data for the years before 1990 are incomplete and cannot be used reliably. Production data are provided by the MFMR based on industry survey landings and fish prices for a large number of differentiated fish products. The problem with the national accounts lies in the estimation of intermediate costs and value-added. These figures are estimated based on constant, average production costs in an economic model developed by the MFMR (MFMR/CBS, no date). On average, intermediate costs – mainly fuel – account for about 40 per cent of the value of output. Because there are no reliable data on labour costs, value-added is evenly split between compensation of employees and gross operating surplus in all fisheries.

For a stable fishery, the assumption of cost proportions that do not vary over time may provide a reasonable approximation. However, Namibia's fisheries have been subject to significant fluctuations, which would cause production costs to fluctuate as well. Environmental disturbances, which are not uncommon, can reduce catch rates by as much as 50 per cent. Consequently, production costs may be underestimated in a bad year and overestimated in a good year. The national accounts include information about the stock of fixed capital for the fishing industry as a whole, but do not estimate the capital stock and capital costs in each fishery.

**Box 1 Calculating resource rent**

Rent is calculated each year for each fish stock using the following formula:

$R^i = TR^i - (IC^i + CE^i + CFC^i + NP^i)$

$NP^i = \pi \times K^i$

Where R is Resource rent
TR is Total revenue
IC is Intermediate consumption
CE is Compensation of employees
CFC is Consumption of fixed capital
NP is Normal profit
$\pi$ is the opportunity cost of capital
K is the value of fixed capital stock in the industry

for each fishery, i, where i = 1,2,3 for hake, pilchard, horse mackerel, respectively.

In actual implementation, average cost is used rather than marginal cost because data about marginal cost are not generally available. This practice introduces an upward bias into the measure of rent when average cost is lower than marginal cost.

All figures are provided from the national accounts except for $\pi$, the opportunity cost of capital. In practice, the opportunity cost, or 'normal profit' as it is also known, is difficult to measure and is, therefore, often defined as either the average return on capital in an economy or the average cost of borrowing capital, adjusted for risk. There is little long-term borrowing in the fishing industry that might indicate an appropriate cost of capital for that sector. After discussions with the MFMR, it was agreed that a 20 per cent rate of return should be used because of the very high risk due to unpredictable factors affecting the fish stock that business must be compensated for. This is much higher than is used for most calculations, and higher than the rate used for calculating the value of sub-soil assets in Namibia (10 per cent) (see further discussion of this issue in Lange et al., 2003).

For the calculation of rent, the Fishing and Fish Processing industries were combined because of the high degree of vertical integration in the industry, especially for freezer trawlers whose continuous-process operation make the separation of fishing from fish processing somewhat arbitrary.

The annual survey of fishing companies, initiated in 1994, provides detailed information about income, expenditures, capital assets, fish catch, employment and ownership. These data have the advantage over national accounts of providing actual income and expenditure data for individual companies in a given year. Because of legal challenges to the survey, only incomplete information is available for 1994–1996 and results for 1997 and 1998 were only recently obtained.

While the company survey would provide an ideal data source, there is not yet information for a long enough period to use these data to estimate rent. In the future, it is hoped that results from the fishing company survey, along with surveys of the fish processing industry initiated in 2001 will be incorporated in the national accounts. Until that time, data from the national accounts are used for constructing the fish accounts because they are the only data source that can provide policy-makers with comprehensive accounts for all fisheries over all the years since Independence.

Estimation of rent requires a figure for fixed capital stock for each fishery. The national accounts do not provide the distribution of fixed capital across different fisheries, so capital stock was allocated to each fishery in proportion to their values of output. While this may not be realistic, it is the best estimate that can be made at this time.

So far, only private costs have been considered in the valuation of fish stocks. However, there are several factors that can cause the private costs of resource extraction to differ from the social costs. These factors include, for example, environmental damage, and the direct or indirect subsidies from the government. There is no evidence that fishing or fish processing causes significant

environmental damage. Government does not directly subsidise the industry. Government does provide some support in terms of resource management, but a preliminary study by Wiium and Uulenga (2001) indicates that the revenue paid by the industry more than covers these costs.

### 2.2.2 Projecting future resource rent

The value of each fish stock is the net present value of the rent it will generate in the future. The present value calculations require projections of future prices, technology, costs of production, fish stock levels and resource exploitation paths. In the absence of alternative information, the convention has been to assume *constant* prices, technology and production costs. The calculation then relies on the remaining variables, levels of stock and exploitation. For a renewable resource like fisheries, there are several possibilities for future levels of stock and the rent generated, which result from different management regimes:

1. Stocks and resource rent remain constant, assuming that stocks are stable and are being managed sustainably.
2. Stocks and resource rent are increasing, assuming that stocks are recovering from depletion.
3. Stocks and resource rent are declining, assuming that depletion will continue until the fish stock collapses irreversibly.

For a given physical stock and current rent, these different assumptions give rise to different values for that same fish stock. Prediction of future stock levels is very difficult because of great uncertainty about the dynamics of many fish populations and great inter-annual fluctuations in fish stock. Although the decline of Namibia's fish stock has been halted, there is little evidence that fish stocks will increase rapidly in the near future. Hence, for the calculation of monetary accounts for fish, it has been assumed that the stocks have stabilised at current levels and that current rent will continue into the future (Box 2). While the fluctuation of rent over the past ten years shows that this is an unrealistic assumption on a year-to-year basis, this assumption is used for lack of any other information at this time.

**Box 2 Monetary value of fish stocks**

Assuming that fish catch and rent remain constant in the future, the net present value is:

$VC^i = R^i / r$

Where $VC^i$ is the value of the *resource* stock at the close of period t
$R^i$ is the total rent a time t
r is the discount rate, 10% for these calculations

for each fishery, i, where i = 1,2,3 for hake, pilchards, horse mackerel

## 3. PHYSICAL AND MONETARY ACCOUNTS FOR FISH

### *3.1 Physical accounts*

The physical accounts for the 10-year period 1990–2000 show that only hake stocks grew, ending the decade 30 per cent higher than in 1990 (Table 2). The pilchard fishery has been subject to large fluctuations, all but disappearing in 1995–96 and ending the decade much lower than it began. This has been attributed in part to regular but unpredictable environmental disturbances in the Benguela System and the consequent temporary migration of fish to Angolan waters (MFMR, 1997; O'Toole, 1998). Even horse mackerel, which improved during the late 1990s, fell below the 1990 level in 2000. The tremendous amount of inter-annual variation in stock indicates how difficult it is to manage Namibia's fisheries.

**Table 2 Physical accounts for hake, pilchard, and horse mackerel in Namibia, 1990–2000 ('000 tons of fishable biomass)**

A. HAKE

| | Opening stock | Catch | Other volume changes | Closing stock |
|---|---|---|---|---|
| 1990 | 906 | 55 | 100 | 951 |
| 1991 | 951 | 56 | 177 | 1072 |
| 1992 | 1072 | 87 | 128 | 1112 |
| 1993 | 1112 | 108 | 91 | 1094 |
| 1994 | 1094 | 112 | 108 | 1090 |
| 1995 | 1090 | 130 | 158 | 1118 |
| 1996 | 1118 | 129 | 170 | 1159 |
| 1997 | 1159 | 110 | 145 | 1194 |
| 1998 | 1194 | 141 | 136 | 1188 |
| 1999 | 1188 | 161 | 159 | 1186 |
| 2000 | 1186 | 160 | 143 | 1170 |

B. PILCHARD

| | Opening stock | Catch | Other volume changes | Closing stock |
|---|---|---|---|---|
| 1990 | 500 | 89 | 249 | 660 |
| 1991 | 660 | 68 | 49 | 641 |
| 1992 | 641 | 82 | -128 | 431 |
| 1993 | 431 | 116 | -100 | 215 |
| 1994 | 215 | 115 | 25 | 125 |
| 1995 | 125 | 95 | -25 | 5 |
| 1996 | 5 | 2 | 147 | 150 |
| 1997 | 150 | 32 | 182 | 300 |
| 1998 | 300 | 65 | 40 | 275 |
| 1999 | 275 | 42 | -8 | 225 |
| 2000 | 225 | 27 | -109 | 90 |

C. HORSE MACKEREL

| | Opening stock | Catch | Other volume changes | Closing stock |
|---|---|---|---|---|
| 1990 | 1450 | 409 | 309 | 1350 |
| 1991 | 1350 | 434 | 1184 | 2100 |
| 1992 | 2100 | 426 | 126 | 1800 |
| 1993 | 1800 | 479 | 179 | 1500 |
| 1994 | 1500 | 360 | 260 | 1400 |
| 1995 | 1400 | 314 | 114 | 1200 |
| 1996 | 1200 | 319 | 119 | 1000 |
| 1997 | 1000 | 306 | 1106 | 1800 |
| 1998 | 1800 | 258 | 258 | 1800 |
| 1999 | 1800 | 288 | 238 | 1750 |
| 2000 | 1750 | 320 | -180 | 1250 |

*Source*: Based on MIRC, 2001.

## *3.2 Monetary accounts*

Pilchard generated the most rent at the beginning of the decade, but was eventually surpassed by hake (Table 3). This is not surprising, since Namibia already had an established pilchard fishery prior to Independence and only achieved control over the other fisheries over the past decade. Pilchard has shown the greatest volatility of rent over the decade. Rent became nearly zero in 1996 when virtually no pilchard was caught. It has not recovered well since that time.

The rent per ton for hake has been steadily rising, reflecting both improvements in the industry and also the devaluation of the Namibian dollar over time, which has a major impact on earnings because most Namibian hake is sold to the lucrative European market. Horse mackerel, though harvested in higher volumes than either of the others, generates the least rent.

**Table 3 Resource rent for pilchard, hake and horse mackerel, 1990–2000 ($N millions)**

| | Pilchard | Hake | Horse Mackerel | Total Rent |
|---|---|---|---|---|
| 1990 | 117 | 27 | 9 | 153 |
| 1991 | 65 | 30 | 30 | 125 |
| 1992 | 135 | 36 | 20 | 192 |
| 1993 | 112 | 106 | 40 | 258 |
| 1994 | 115 | 162 | 46 | 324 |
| 1995 | 76 | 163 | 41 | 280 |
| 1996 | * | 96 | 51 | 147 |
| 1997 | 14 | 146 | 45 | 206 |
| 1998 | 67 | 299 | 71 | 437 |
| 1999 | 32 | 294 | 75 | 401 |
| 2000 | 29 | 390 | 84 | 502 |

* less than 1.0.
NB: assumes a 20% rate of return to fixed capital.
*Source*: Based on author's calculations using methodology described in text.

Table 4 shows the monetary accounts in current prices and in constant 1995 prices. Since the formula for calculating asset value is based on rent, trends for current-price asset values of individual fisheries parallel those of Table 3. Adjusting for inflation reveals that there has been a 37 per cent increase in the real, *economic value* of fish stocks from $N2,323 million in 1990 to $N3,184 million in 2000, even though there was a decline in *physical stocks* of pilchard and horse mackerel over that period. This increase in value is attributable to the increase in the physical stock of hake as well as management and economic factors that have improved the rent generating capacity of the hake and horse mackerel fisheries.

**Table 4 Monetary accounts for hake, pilchard and horse mackerel in Namibia, 1990–2000 ($N million)**

**A. Asset value in current prices**

| | Pilchard | Hake | Horse Mackerel | Total |
|---|---|---|---|---|
| 1990 | 1168 | 268 | 90 | 1526 |
| 1991 | 646 | 304 | 301 | 1250 |
| 1992 | 1348 | 365 | 204 | 1916 |
| 1993 | 1120 | 1063 | 401 | 2584 |
| 1994 | 1154 | 1625 | 465 | 3243 |
| 1995 | 756 | 1627 | 414 | 2797 |
| 1996 | 4 | 959 | 508 | 1472 |
| 1997 | 144 | 1464 | 454 | 2062 |
| 1998 | 671 | 2992 | 710 | 4373 |
| 1999 | 318 | 2942 | 749 | 4010 |
| 2000 | 292 | 3897 | 835 | 5024 |

**B. Asset value in constant 1995 prices**

| | Pilchard | Hake | Horse Mackerel | Total |
|---|---|---|---|---|
| 1990 | 1778 | 408 | 138 | 2323 |
| 1991 | 939 | 442 | 437 | 1818 |
| 1992 | 1788 | 484 | 271 | 2543 |
| 1993 | 1370 | 1299 | 490 | 3159 |
| 1994 | 1219 | 1718 | 491 | 3428 |
| 1995 | 756 | 1627 | 414 | 2797 |
| 1996 | 4 | 838 | 444 | 1285 |
| 1997 | 118 | 1194 | 370 | 1682 |
| 1998 | 504 | 2248 | 533 | 3286 |
| 1999 | 224 | 2075 | 528 | 2828 |
| 2000 | 185 | 2469 | 529 | 3184 |

NB: Values were estimated for the closing stock using the present discounted value method assuming a 10 per cent social discount rate and a 20 per cent cost of fixed capital. Figures may not sum to total because of rounding.
*Source*: Based on author's calculations using methodology described in the text.

Hake increased its share of fish wealth from 18 per cent at the beginning of the decade to 78 per cent by 2000. Horse mackerel also increased its share. The emergence of hake as the most valuable fish stock represents a success for government policy which targeted the development of the hake fishery, controlled almost entirely by foreigners prior to Independence. At the same time, the declining share of pilchard is not simply due to the growth of the other fisheries; rather it resulted in large part to the decline of the fishery – both physical stocks and per unit rent declined considerably over the decade.

## 4. RESOURCE RENT, ECONOMIC EFFICIENCY AND EQUITY

In managing a public resource like marine fisheries, government policy can be guided by either of two alternative objectives: the promotion of commercial exploitation to maximise resource rent or the promotion of a combination of socio-economic objectives in which economic efficiency plays a more limited role. Some countries may adopt a mix of these policy objectives for different fisheries. Namibian policy has primarily adopted the first objective, commercial exploitation. Namibian policy also has socio-economic goals, notably the Namibianisation of the fishing industry, as well as a more general objective of utilising this national resource for the broader benefit of all Namibians. Namibia seeks to achieve these socio-economic objectives within an economically efficient, commercial fishing industry, but designing policy to achieve both objectives presents a difficult challenge.

Substantial amounts of resource rent are generated by the Namibian fishing industry. The government established a system of quota levies in order to help achieve its objectives of sustainable and equitable management of the industry. While full recovery of rent is not practicable because the significant year-to-year fluctuations in rent, recovery of a significant portion of the expected long-term rent is important for several reasons:

- Recovery of rent contributes to the *sustainable management* of fisheries by removing the economic incentives for overfishing and depletion of the resource.
- Set at the appropriate level, levies create incentives for the most *economically efficient* (most profitable) level of fishing, based on both biological and economic criteria.

- Recovery of rent promotes *equity* by recovering excess profits obtained from a national asset which can be used for development that benefits all Namibians, not just the few involved in the fishing industry (see Lange and Motinga, 1997 for further discussion of these issues).

A comparison of the rent generated and the taxes levied indicates that relatively little rent is being collected (Table 5). In the first few years after Independence, when quota levies were first introduced, government recovered nearly half the rent. The share recovered has since dropped to only 19 per cent in 2000. It may be reasonable to keep taxes low in the pilchard fishery, given the drop in stocks and uncertainty. But even the hake fishery, which has generated fairly steady rents, appears to be taxed very lightly. The declining recovery of rent has two sources: first, an increasing share of Namibian-owned companies, which are eligible for up to 50 per cent subsidies on their quota levies; secondly, the failure to index quota levies to inflation, a common problem faced by governments who find it politically difficult to adjust taxes for inflation. While quota levies have been increased in recent years, the increase has not kept up with inflation.

**Table 5 Recovery of resource rent through taxes, 1990–2000**

| | Taxes paid by fishery ($N million) | | | | Percent of rent recovered by taxes | | | |
|---|---|---|---|---|---|---|---|---|
| | Pilchard | Hake | Horse Mackerel | Total | Pilchard | Hake | Horse Mackerel | All |
| 1990 | Na | Na | Na | 44 | Na | Na | Na | 29 |
| 1991 | Na | Na | Na | 64 | Na | Na | Na | 51 |
| 1992 | Na | Na | Na | 87 | Na | Na | Na | 45 |
| 1993 | 10 | 60 | 25 | 97 | 9 | 56 | 63 | 36 |
| 1994 | 11 | 69 | 26 | 109 | 9 | 42 | 55 | 31 |
| 1995 | 6 | 66 | 24 | 106 | 7 | 41 | 59 | 33 |
| 1996 | 1 | 37 | 13 | 68 | 253 | 38 | 26 | 40 |
| 1997 | 4 | 57 | 15 | 84 | 30 | 39 | 34 | 35 |
| 1998 | 9 | 55 | 19 | 92 | 13 | 18 | 26 | 18 |
| 1999 | 6 | 71 | 19 | 114 | 19 | 24 | 26 | 26 |
| 2000 | 5 | 64 | 17 | 103 | 18 | 16 | 21 | 19 |

Na: not available
NB: Taxes are not broken down by fishery for 1990-1992. Taxes include quota levies, Sea Fisheries Fund Levies, and other fees mainly by-catch and licensing fees. The distribution of taxes by fishery in 2000 is estimated.
*Source*: Rent from Table 2. Taxes from MFMR 2000; 2001; 2002 and CBS, 2001b.

At the beginning of this report, it was pointed out that most countries do not attempt to recover any rent, but rather subsidise fishing. So even the low rate of rent recovery in Namibia is an improvement over the policies of many other countries. Table 6 provides a comparison of rent recovery in Namibia, Norway and the Philippines. Norway's fisheries have been managed in a way that generates no positive rent – rent from fisheries was negative and government provided considerable subsidies until 1995 when policies began to change. Norway's fishing industry has two sectors: small-scale traditional fishing and more recent, commercial aquaculture. Fishing policy was intended to sustain regional economies in Norway by supporting traditional fishing communities, even though they were economically inefficient. The new policy has cut fishing subsidies and seeks to promote more efficient fish farming. The Philippines has two fishing sectors, a large-scale commercial industry and a small-scale industry that supplies local markets. The rate of rent

recovery for the two sectors is quite low, averaging only 11 per cent over the period 1988–1993 (Lange, 2000).

One of the economic reasons often given for a relatively high rate of recovery of rent is equity. Sustainable management of fisheries (the first two arguments) can be achieved through other means, such as appropriate setting and enforcement of TACs, which Namibia has done quite successfully. Sustainable management may be complemented by rent recovery but it does not depend on it. However, the direct economic benefits from fishing may be limited to a relatively small group: owners of fishing companies and fishing industry workers, who receive relatively high wages. In this case, the only way that fisheries can benefit those not directly involved in the fishing industry is when government appropriates some of the resource rent and applies it in the funding of broad-based economic development.

**Table 6 Resource rent and government appropriation of rent in Norway, Namibia and the Philippines**

| | **Norway (NOK millions)** | | **Namibia ($N millions)** | | **Philippines (pesos millions)** | |
|---|---|---|---|---|---|---|
| | **Rent** | **Govt. Approp.** | **Rent** | **Govt. Approp.** | **Rent** | **Govt. Approp.** |
| 1985 | -1,231 | -1,033 | | | | |
| 1986 | -1,180 | -977 | | | | |
| 1987 | -938 | -647 | | | | |
| 1988 | -1,954 | -451 | | | 3,837 | 313 |
| 1989 | -3,899 | -601 | | | 3,980 | 433 |
| 1990 | -3,478 | -911 | 153 | 44 | 4,270 | 534 |
| 1991 | -2,491 | -722 | 125 | 64 | 5,106 | 655 |
| 1992 | -2,815 | -475 | 192 | 87 | 5,318 | 502 |
| 1993 | -2,107 | -103 | 270 | 97 | 5,669 | 558 |
| 1994 | -381 | -32 | 345 | 109 | | |
| 1995 | 51 | 63 | 318 | 106 | | |
| 1996 | | | 167 | 68 | | |
| 1997 | | | 241 | 84 | | |
| 1998 | | | 499 | 92 | | |
| 1999 | | | 444 | 114 | | |
| 2000 | | | 542 | 103 | | |

Note: Blank means information not available.
Government appropriation is measured as taxes minus subsidies. A negative entry indicates a net subsidy.
Exchange rates: The NOK ranged from US$0.16 (1985) to US$0.11 (1995). The $N ranged from US$0.39 (1990) to US$0.15 (2000). The Philippine peso ranged from US$0.047 (1988) to US$0.037(1993).
*Source*: Norway: Lindholt, 2000; Statistics Norway, 2000. Namibia: Table 5. Philippines: NSCB, 1998; Lange, 2000.

This argument would tend to suggest that high rent recovery is best, but it may be argued that it is best for rents to accrue to the private sector because the private sector does a better job than government of investing profits for the benefit of all. It is difficult to determine which is most economically efficient and best for Namibia's long-term development.

## 5. CONCLUSIONS

In a relatively short period of time since Independence, Namibia has achieved remarkable success in managing its fisheries. Namibia halted further collapse of its fisheries (with the possible exception of pilchards) and vastly increased the economic contribution of fisheries to the Namibian economy, while avoiding the subsidisation of the industry seen in so many other countries. The real economic value of fish as a natural asset increased by 37 per cent, from $N2,323 million in 1990 to $N3,184 million in 2000. This increase is due to the partial recovery of some fisheries and improvements in management that have increased the rent generated. The increase in economic value means that fish, if managed sustainably, will continue to provide income to all future generations of Namibians. This represents a tremendous achievement for MFMR and its post-Independence policy.

There are many different groups that benefit from a successful fishing industry: private companies benefit from profits and resource rent earned, workers and their families benefit from relatively well-paid employment, and the public benefits from resource rent collected by government which can be used to support broad-based national development. While the profitability of fishing is extremely vulnerable to factors beyond the control of government, such as marine environmental events, international markets for fish and costs of imported inputs like fuel, the *distribution of benefits* from fisheries is influenced by government policy regarding quota levies. The importance of fishing to Namibia's economy calls for continued careful management so fishing can provide income and employment for future generations.

## 6. REFERENCES


CBS. 2001a. *National Accounts*. Central Bureau of Statistics: Windhoek, Namibia. 33pp.

CBS. 2001b. Unpublished data on fishing and fish processing in the national accounts.

FAO. 1993. The state of food and agriculture 1992, FAO, Rome.

_____.2001. The state of food and agriculture 2000. FAO, Rome.

Food and Agriculture Organisation and United Nations Statistical Division (forthcoming) *Handbook on Economic and Environmental Accounting of Fisheries*. UN, New York.

Kaufmann, B. and G. Green. 1997. Cost-recovery as a fisheries management tool in *Marine Resource Economics,* 12(1), 57-66.

Kirchner, C., A. Sakko, and J. I. Barnes. 1999. An economic value of the Namibian recreational shore angling fishery. *South African Journal of Marine Science* 22: 17-25.

Lange, G. 2003. Fisheries accounts: Management of a recovering fishery. *In*: G. Lange, R. Hassan, and K. Hamilton (eds.) *Environmental accounting in action: Case studies from southern Africa.* Edward Elgar Publishing, Cheltenham, UK (in press)

_____.2000. Policy uses of the Philippine System of Integrated Environmental and Economic Accounts. Report to the Philippines National Statistical Coordination Board, Manila. 39pp.

Lange, G., R. Hassan, and K. Hamilton. 2003. *Environmental Accounting in Action: Case Studies from Southern Africa*. Cheltenham, UK: Edward Elgar Publishers. (in press).

Lange, G. and D.J. Motinga. 1997. The contribution of resource rents from minerals and fisheries to sustainable economic development in Namibia. Research Discussion Paper No. 19, Directorate of Environmental Affairs, Ministry of Environment and Tourism, Windhoek, Namibia. 32pp.

Lindholt, L. 2000. On natural resource rent and the wealth of a nation, a study based on national accounts in Norway 1930-95. Discussion Paper No.281, Statistics Norway Research Department, Oslo.

Milazzo, M. 1998. Subsidies in world fisheries. World Bank Technical Paper No. 406, World Bank, Washington, D.C.

MFMR. 2000. Report of the activities and state of the fisheries sector 1997 and 1998. Windhoek, Namibia. 67pp.

_____.2001. *Annual Report 2000.* Windhoek, Namibia. 23pp.

_____.Forthcoming. *Annual Report 2001*. Windhoek, Namibia. In press.

MFMR/CSO (No date), Basemod, national fisheries database, Ministry of Fisheries and Marine Resources and the Central Statistical Office, Government of Namibia.

Namibia Foundation (Ed.) 1998. *Namibia Brief* No. 20, January, Windhoek, Namibia.

Marine Information and Research Centre, Ministry of Fisheries and Marine Resources, 2001. Unpublished data on fish stocks and fish landings. Swakopmund, Namibia.

O'Toole, M.J. 1998. Marine environmental threats in Namibia, Research Discussion Paper No. 23, Directorate of Environmental Affairs, Ministry of Environment and Tourism, Windhoek, Namibia. 48pp.

United Nations. 2002. *System of integrated environmental and economic accounts*. Draft available on the UN website: www.un.org

Wiium, V. and A. Uulenga. 2001. Fisheries management costs and rent extraction, the case of Namibia. Unpublished paper for Ministry of Fisheries and Marine Resources. 48pp.

Zeybrandt, F. and J. Barnes. 2002. Economic characteristics of demand in Namibia's recreational marine shore fishery. *South African Journal of Marine Science* 23: 145-156.

## APPENDIX 1 CALCULATING RESOURCE RENT FOR FISH

This section demonstrates how resource rent is calculated for fishing. Using the formula in Box 1 and the data from the national accounts reported in Table A1, the rent in 1993 for a 20 per cent return to fixed capital stock can be calculated as:

| Item number and description | | Value (in millions of $N) | | |
|---|---|---|---|---|
| | | **Fishing** | **Fish Processing** | **Fishing + Fish Processing** |
| 1.0 | Output minus | 550 | 524 | |
| 2.0 | Intermediate consumption | - 211 | - 205 | |
| 3.1 | Net taxes | - 98 | - 1 | |
| 3.2 | Compensation of employees | - 120 | - 44 | |
| 4.0 | Consumption of Fixed Capital (CFC) | - 13 | - 13 | |
| 6.1 | 20% return to Capital Stock | - 49 | - 49 | |
| | = RENT | = 156 | = 114 | = 270 |

The value of output for fishing and fish processing can be disaggregated by major fishery, as shown in Table A2. These shares are then used to calculate the value of each fishery using the data of Table A1, except for taxes on fishing, for which independent information by fishery is available. Pelagic fish are primarily pilchards; demersal – primarily hake; and midwater – primarily horse mackerel.

**Table A1 Calculating resource rent for fishing, 1993–2001**

| | | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|---|
| **I. FISHING** | | | | | | | | | |
| 1 Output | | 550 | 719 | 807 | 1028 | 1067 | 1542 | 1602 | 1721 |
| 2 Intermediate Consumption | | 211 | 279 | 316 | 399 | 417 | 609 | 631 | 677 |
| 3 Value added | | 338 | 440 | 491 | 629 | 650 | 933 | 971 | 1044 |
| 3.1 Net taxes | | 98 | 118 | 100 | 57 | 89 | 91 | 114 | 97 |
| 3.2 Compensation of Employees | | 120 | 161 | 195 | 286 | 281 | 421 | 429 | 474 |
| 3.3 GOS | | 120 | 161 | 195 | 286 | 281 | 421 | 429 | 474 |
| Capital Costs | | | | | | | | | |
| 4 Consumption of Fixed Capital | | 13 | 14 | 18 | 22 | 25 | 32 | 40 | 47 |
| 5 Capital Stock | | 247 | 265 | 344 | 433 | 491 | 632 | 782 | 917 |
| 6.1 10% return | | 25 | 26 | 34 | 43 | 49 | 63 | 78 | 92 |
| 6.2 20% return | | 49 | 53 | 69 | 87 | 98 | 126 | 156 | 183 |
| Resource rent | | | | | | | | | |
| 7.1 10% return | | 181 | 238 | 244 | 278 | 295 | 417 | 424 | 432 |
| 7.2 20% return | | 156 | 212 | 209 | 235 | 246 | 354 | 346 | 340 |
| **II. FISH PROCESSING** | | | | | | | | | |
| 1 Output | | 524 | 702 | 782 | 553 | 782 | 1275 | 1127 | 1165 |
| 2 Intermediate Consumption | | 205 | 310 | 392 | 401 | 501 | 733 | 676 | 617 |
| 3 Value added | | 319 | 392 | 390 | 153 | 281 | 543 | 451 | 548 |
| 3.1 Net taxes | | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 3 |
| 3.2 Compensation of Employees | | 144 | 181 | 193 | 125 | 185 | 232 | 207 | 195 |
| 3.3 GOS | | 174 | 210 | 195 | 27 | 94 | 308 | 241 | 350 |
| Capital Costs | | | | | | | | | |
| 4 Consumption of Fixed Capital | | 13 | 17 | 19 | 21 | 23 | 37 | 33 | 34 |
| 5 Capital Stock | | 243 | 306 | 346 | 372 | 390 | 638 | 563 | 582 |
| 6.1 10% return | | 24 | 31 | 35 | 37 | 39 | 64 | 56 | 58 |
| 6.2 20% return | | 49 | 61 | 69 | 74 | 78 | 128 | 113 | 116 |
| Resource rent | | | | | | | | | |
| 7.1 10% return | | 138 | 164 | 143 | -30 | 34 | 210 | 154 | 261 |
| 7.2 20% return | | 114 | 133 | 109 | -67 | -5 | 146 | 98 | 202 |
| **III. TOTAL RENT** | | | | | | | | | |
| I=10% | Fishing | 181 | 238 | 244 | 278 | 295 | 417 | 424 | 432 |
| | Fish Processing | 138 | 164 | 143 | -30 | 34 | 210 | 154 | 261 |
| | Total | 319 | 402 | 387 | 248 | 329 | 626 | 579 | 692 |
| I=20% | Fishing | 156 | 212 | 209 | 235 | 246 | 354 | 346 | 340 |
| | Fish Processing | 114 | 133 | 109 | -67 | -5 | 146 | 98 | 202 |
| | Total | 270 | 345 | 318 | 167 | 241 | 499 | 444 | 542 |

*Source*: unpublished data from the national accounts.

**Table A2 Value of output by fishery, 1993–2000 (%)**

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|
| **FISHING** | | | | | | | | |
| Pelagic | 17 | 15 | 12 | 3 | 7 | 8 | 5 | 2 |
| Demersal | 48 | 55 | 60 | 57 | 56 | 61 | 64 | 64 |
| Midwater | 24 | 19 | 16 | 23 | 19 | 19 | 23 | 26 |
| Other | 10 | 10 | 12 | 17 | 18 | 12 | 8 | 8 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **FISH PROCESSING** | | | | | | | | |
| Pelagic | 81 | 67 | 52 | 8 | 30 | 27 | 15 | 9 |
| Demersal | 16 | 27 | 32 | 54 | 39 | 58 | 77 | 84 |
| Midwater | 1 | 0 | 1 | 2 | 1 | 1 | 1 | 1 |
| Other | 3 | 5 | 14 | 36 | 30 | 14 | 8 | 6 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

*Source*: unpublished data from the national accounts.

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