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# Summary

## Conclusions

### *Expectations of Information Requirements*

The purpose and principles of the Fisheries Act 1996 (the 1996 Act) provide a framework for the information required to manage the fisheries resource. The 1996 Act provides points of reference for fish stock[1] management as well as management of any adverse effects of fishing on the aquatic environment.

### *Information for the Sustainable Utilisation of Fisheries*

The Ministry of Fisheries (the Ministry) is responsible for administering the 1996 Act and advising the Minister of Fisheries (the Minister) on management of the fisheries asset using the reference points established in the 1996 Act. Managing the nation's fisheries asset is difficult due to the incomplete scientific understanding of all the complex factors that affect fish stocks and the need to maximise the benefits of research for sustainable management.

The Ministry has developed a robust strategic approach to the management of fisheries – including research planning groups, a research co-ordination committee, and the development of medium term research plans for important species, fisheries and research areas. A system of prioritisation, which includes input from stakeholders, means that the Ministry targets its research effort at the areas of greatest need. The Ministry notes that there are resource constraints – not only in terms of funding but also with respect to the scientific expertise required to undertake stock assessment work.

1 For an explanation of our use of the terms "fish stock" and "Fishstock" see paragraph 5.036.

We acknowledge the Ministry's belief that it is able to manage fish stocks without necessarily knowing their status in detail. It believes that the information it has on productivity, growth rates and commercial catches is sufficient to advise the Minister on management approaches. The Ministry told us that the indicators that it monitors for most stocks show no signs which suggest that stocks are not being managed sustainably. The Ministry has been managing the nation's fisheries asset for many years and has detailed records for some species dating back to the 1930s.

We examined the information available for 44 of the 257 Fishstocks[1]. The species in those 44 Fishstocks represent 60% by value of all fish caught in New Zealand's exclusive economic zone.

In our view the Ministry is unable to be certain if 31 of those Fishstocks are being utilised to their potential, or, in some cases, being utilised sustainably at all For those 31 Fishstocks, we believe that there are significant gaps in the information required by the 1996 Act for the sustainable utilisation of fisheries.

We conclude, therefore, that the Ministry manages most fish stocks without being sure if this management is sustainable. Because of the lack of information, the Ministry also cannot be sure that the catch levels that are established allow for fisheries to be utilised to their potential. Under-utilisation could be to the detriment of export receipts, employment in the industry, and tax revenue. This conclusion is similar to that reached by the Audit Office and the Parliamentary Commissioner for the Environment in 1990.[2]

We believe that the status of the Fishstocks needs to be more clearly defined and articulated by the Ministry in its reports – such as the *Report from the Fishery Assessment Plenary, May 1999: stock assessments and yield estimates*. This would give an indication of the levels of uncertainty about the status and sustainability of each stock.

1 For an explanation of our use of the terms "fish stock" and "Fishstock" see paragraph 5.036.

2 *Marine Fisheries Management*, joint report of the Controller and Auditor-General and the Parliamentary Commissioner for the Environment, December 1990, ISBN 0 477 02818 7.

We acknowledge that the Ministry has a number of techniques at its disposal for managing with uncertain information – including adaptive management, decision rules, and closure of certain fisheries areas – which allow for conservative management approaches. We also note that managing fish stocks with little or no information on their status does not necessarily pose a risk to that stock. However, we believe that any conservative management approach needs information, from time to time, on the actual status of the stock for assurance that the management is sustainable.

## *The Aquatic Environment*

The 1996 Act has a number of environmental principles that must be considered in the management of the fisheries resource. The Ministry developed a medium-term research plan for the aquatic environment in 1998. Some projects have been completed and recently, more research projects have been commissioned to understand the effects of fishing on the environment. However, we believe that the Ministry needs to perform more work to meet the aquatic environment requirements of the 1996 Act.

We believe that the Ministry has been slow to commit resources to meet the environmental principles of the 1996 Act, given that it had been aware of those principles and their implications for some time.

There is some collaboration with other agencies (such as the Ministry for the Environment, Public Good Science Fund, and the Department of Conservation) which will help the Ministry to address the need for better information about the aquatic environment. We believe that the Ministry needs to make greater commitment to funding research on the effects of fishing on the aquatic environment in order to give effect to the 1996 Act.

### *Ministry of Fisheries Research Budget*

There are a number of sources of funding for fisheries research. There is also potential overlap in the areas of research of other organisations. The Ministry is attempting to avoid duplication and to ensure compatibility and complementarity of research funding.

We looked particularly at the research contracted by the Ministry to support its advice to the Minister. The introduction of the 1996 Act requires, we believe, more information than did the Fisheries Act 1983. Nevertheless, we note the trend of decrease in the annual research budget this decade from $22 million in 1991 to $13 million in 1998. In view of our other findings we think that trend is a matter for concern.

In 1999-2000 research is budgeted to increase by $5 million. We hope that this signals a realisation that the Ministry needs more information if it is to give effect to the purpose and principles in the 1996 Act.

Of the Ministry's total research budget of around $20 million, the budget for research on the aquatic environment for 1999-2000 is $481,445 – which will purchase up to six desk-top studies.

We believe that, currently, the Ministry is not able to make informed recommendations to the Minister on issues such as the effects of fishing on the environment, and the inter-relationship of fish species. We note that little work on this subject has been contracted for in 1999-2000.

## Recommendations

**We recommend that the Ministry:**

- **ensures that all information on the status of the Fishstocks clearly specifies the level of uncertainty in that information;**
- **recognises and addresses the level of uncertainty of the status of the Fishstocks in its annual research and management documents;**

- ensures that information is collected that will allow the Fishstocks to be utilised to their potential (i.e. maximum sustainable yield);
- gives greater priority to fulfilling the environmental requirements of the 1996 Act;
- continues to work with the Ministry for the Environment on the Environmental Performance Indicators Programme;
- ensures that research funding does not overlap, and avoids duplication of research by continuing to work co-operatively with other research funders; and
- recognises in its budgeting the research required to fulfil the environmental principles of the 1996 Act.

# Introduction

5.001 The purpose of the Fisheries Act 1996 (the 1996 Act) is to ensure sustainable utilisation of the country's fisheries resource.

5.002 This report is about:

- the information required to achieve sustainable management of the fisheries resource within a healthy aquatic ecosystem; and
- the extent to which relevant and adequate information is actually being used to manage the country's fisheries within a sustainable framework.

## Why We Did the Audit

5.003 Fish in the waters around New Zealand are a valuable asset – socially, economically, and culturally. The fisheries resource can be quantified in terms of export receipts and employment figures from commercial fishing. However, there are other significant interests involved. Coastal Māori have long utilised the resource and traditional fishing continues to be important. Recreational fishing is likewise important, involving high numbers of people. Other people value the resource in a pristine condition.

5.004 Meeting such diverse interests requires expert management so that all those with an interest are able to enjoy the fisheries resource – the 1996 Act sets out how it is to be managed.

5.005 Given the importance of the fisheries resource – and the unique involvement of the Crown in rationing it – Parliament needs to be assured of the adequacy of the arrangements for sustaining the fisheries.

5.006 We believe that good resource management requires information on the state of the resource. Accordingly, we decided to examine the robustness of the information that the Ministry of Fisheries (the Ministry) provides to the Minister of Fisheries (the Minister) to underpin fisheries management decisions.

## How We Undertook the Audit

5.007 Auditing the sustainable management of a natural resource such as fisheries requires that we determine:

- what information needs to be known about the resource;
- how information can be obtained; and
- what information has been obtained.

5.008 We used the purpose and principles of the 1996 Act as the basis of our expectations for the audit of the information requirements. We further developed these expectations by interviewing Ministry staff, marine scientists, and other stakeholders (including environmentalists, commercial fishers, and Māori). In addition, we attended Ministry research planning meetings for specific species and recreational fishing.

### *Our Expectations*

5.009 We expected that the Ministry's advice to the Minister – for the purpose of setting an annual catch level for each Fishstock – would include information on:

**Catch Levels**

- the catch level that would produce the biomass providing the maximum sustainable yield;

**Aquatic Environment**

- the impact of fishing on the aquatic environment;
- the habitats of significance; and
- associated and dependent stocks.

5.010 To focus our audit we assessed the information given to the Minister by the Ministry to support management decisions for eight key species – hoki, orange roughy, snapper, ling, bluenose, paua, rock lobster, and squid. The 44 Fishstocks containing these species represent over 60% by value of all fish caught in New Zealand's exclusive economic zone. They live in a range of habitats (inshore and deep water), and a number of them are highly prized by Māori and recreational fishers.

# Background

## The Fisheries Resource

5.011 New Zealand's fisheries are a valuable natural and renewable resource, important to the country's social, economic, and cultural well-being.

5.012 Our exclusive economic zone (declared in 1978) comprises approximately 1.3 million square miles. This is 15 times the size of our land area, and is one of the largest in the world. Fish from the seas in the exclusive economic zone make a major contribution to the economy through the commercial seafood industry, Māori traditional fishing activities, and the recreational sector. Furthermore, people also value non-extractive uses such as diving.

5.013 The commercial seafood industry employs over 10,000 people, and the annual export value of the fish harvested is between $1,100 million and $1,500 million. Recreational fishing is very popular (especially in northern inshore waters) and it is estimated that one in five New Zealanders are recreational fishers. Māori have long-standing cultural ties with fisheries and these ties are recognised and provided for in law.

## The Need for Effective Management of the Fisheries Asset

5.014 Many of the world's fisheries have been described as being in a state of crisis. For example, recently (1997) the Auditor-General of Canada reported on the state of Canada's Atlantic groundfish[3] fisheries, saying that:

> *The 1990s saw the collapse of most of Atlantic Canada's commercial groundfish stocks.*

3 "Groundfish" include cod, haddock, halibut, and various flatfish.

*As Atlantic groundfish stocks headed toward their lowest levels in recorded history, Fisheries and Oceans Canada and the Northwest Atlantic Fisheries Organisation progressively closed off most of the Atlantic commercial fisheries and significantly reduced the total allowable catch in others. The majority of these fisheries currently remain closed.*

5.015 The Canadian experience demonstrates:

- the vulnerability of some fish stocks to collapse;
- the need to ensure that fisheries management has a clear focus on sustainability; and
- the need for management to take into account both human-induced and naturally occurring changes in fish populations and the marine environment.

## 1990 Marine Fisheries Management Report

5.016 The 1990 joint report of the Audit Office and the Parliamentary Commissioner for the Environment (see page 52) examined the management of marine fisheries and, specifically, the operation of the quota management system. The report concluded that:

*The findings indicate a system struggling to provide the necessary information for management decisions which can control fishing at sustainable levels and ensure sustainability of the fishery resource. This is reflected in a lack of sufficient information about the fish.*

*Because of the lack of information, there is greater risk and greater personal judgement in making decisions. The risk factor, created by this information lack, provides little confidence that fish are being harvested at a sustainable rate.*

5.017 Given the change in fisheries management since 1990 brought about by the 1996 Act, this audit was not intended as a follow-up of the 1990 report. Nonetheless, we are mindful of the conclusions of that report and have consulted the Parliamentary Commissioner for the Environment throughout the course of this audit.

# HOKI

*Macruronus novaezelandiae*

Hoki


| FISH STOCK | TACC 1998/99 | QUOTA OWNED | QUOTA HELD |
|---|---|---|---|
| HOK1 | 250000.000 | | |
| HOK10 | 10.000 | | |
| TOTAL | 350010.000 | | |

## Statutory Requirements

### Sustainability

5.018 The 1996 Act provides the framework for ensuring that fisheries are managed on a sustainable basis and sets out principles for the protection of the aquatic environment from any adverse effects of fishing. Section 8 defines the purpose of the 1996 Act as providing for the utilisation of fisheries while ensuring sustainability.

5.019 The 1996 Act defines "utilisation" as:

> *Conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic and cultural well-being.*

5.020 The 1996 Act defines "ensuring sustainability" as:

> *(a) Maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations; and*
>
> *(b) Avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment.*

### Environmental Principles

5.021 Section 9 of the 1996 Act also sets out certain environmental principles:

> *All persons exercising or performing functions, duties, or powers under this Act, in relation to the utilisation of fisheries resources or ensuring sustainability shall take into account the following environmental principles:*
>
> *(a) Associated or dependent species should be maintained above a level that ensures their long-term viability;*
>
> *(b) Biological diversity of the aquatic environment should be maintained; and*
>
> *(c) Habitat of particular significance for fisheries management should be protected.*

5.022 The Ministry's published commentary on the 1996 Act says of the environmental principles that:

> [They] *elaborate on the purpose of the Act and incorporate New Zealand's international obligations under the United Nations Law of the Sea and Convention on Biological Diversity. This is to ensure that, in managing the fishing resources, account is taken of the wider effect of fishing in the ecosystem. For instance consideration must be given to the effect of fishing on species caught unintentionally or whose place in the food chain may be affected.*

5.023 In early 1998 the Ministry (on behalf of the Minister) commissioned an independent review of the 1996 Act. A summary of the reviewer's recommendations is contained in Appendix 1 on page 100.

## *Information Requirements for Decisions on Sustainability*

5.024 Section 10 of the 1996 Act requires adherence to certain principles concerning information about sustainable fisheries:

> *All persons exercising or performing functions, duties or powers under this Act, in relation to the utilisation of fisheries resources or ensuring sustainability, shall take into account the following principles:*
>
> *(a) Decisions should be based on the best available information.*
>
> *(b) Decision makers should consider any uncertainty in the information available in any case.*
>
> *(c) Decision makers should be cautious when information is uncertain, unreliable or inadequate.*
>
> *(d) The absence of, or uncertainty in, information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of the Act.*

5.025 In its commentary on section 10 the Ministry says that, in its view, the information provisions mean that:

> *Decisions need to be based on the best available information and that in the face of uncertainty decision-makers need to be cautious. They must bear in mind that the overriding purpose of the Act is to provide for sustainable fishing.*

## Other Requirements

5.026 In addition to fisheries being utilised to enable people to provide for their social, economic and cultural well-being, it is assumed that the Minister will weigh up a variety of options and impacts. A 1997 decision of the Court of Appeal[4] reinforced the view that the Minister has responsibilities in this area. The Court commented that:

> *All we wish to say for the future is that the Minister would be wise to undertake a careful cost/benefit analysis of a reasonable range of options available to him in moving the fishery towards maximum sustainable yield. If the Minister ultimately thinks that a solution having major economic impact is immediately necessary, those affected should be able to see, first, that all other reasonable possibilities have been carefully analysed, and second, why the solution adopted was considered to be the preferable one.*

4 *NZ Fishing Industry Association (Inc) and Ors v Minister of Fisheries* (Court of Appeal, CA82/97, 22 July 1997).

# The Management of Fisheries

## The Government's Strategic Direction for Fisheries Management

5.027 The Government has made two major strategic statements directly relating to fisheries management and the science required.

5.028 In September 1995 the Minister for the Environment released *Environment 2010*, which stated that the Government's intention is to:

> *conserve and manage New Zealand's fisheries for the benefit of all New Zealanders by providing for sustainable utilisation of fisheries resources, including commercial, recreational and Maori customary take.*

5.029 In 1996 the Government released *RS&T 2010,* which sets out the nation's science strategy. Two areas were directly related to fisheries science:

- knowledge of the country's biological resources; and
- knowledge of its oceans.

## The Role of the Ministry of Fisheries

5.030 In its *5-Year Strategic Plan,* the Ministry describes its role as follows:

> *The primary role of the government in fisheries management is to provide for the utilisation of fisheries resources while ensuring their sustainability. As the principal Government agency in fisheries management, the Ministry collaborates with other government agencies in advising on and implementing government policy in the following areas of core responsibility: ensuring ecological sustainability; meeting Treaty of Waitangi and international responsibilities; enabling efficient resource use; and ensuring the integrity of management systems.*

5.031 Of those four areas of core responsibility, that of ensuring ecological sustainability is most relevant to this audit. The Ministry has identified four functions under this responsibility:

- specifying environmental goals and standards related to the use of fisheries and the impact of fishing on the aquatic ecosystem;
- approving sustainability plans for fisheries;
- setting sustainability measures such as total allowable catches and size limits; and
- monitoring the health of fisheries and the aquatic ecosystem.

## Ecological Sustainability

5.032 Marine ecosystems are a complex arrangement of life forms that may be interdependent to varying degrees. Changes in one feature of an ecosystem may produce change in another.

5.033 Fishing can affect the aquatic environment when fishing gear (such as trawls and dredges) is dragged across the sea floor, physically disturbing the habitat. Removal by fishing of both the fish species being targeted and other non-targeted species may also produce changes in the ecosystem. Fishing activity can also affect marine mammals and marine birds.

5.034 However, as well as human intervention, significant changes to aquatic ecosystems can be caused by natural factors such as climate changes (which can alter sea temperatures and ocean currents). Such changes can have major effects on fish stocks. Pollution and siltation of inshore fish breeding grounds can also cause changes to the aquatic ecosystem.[5]

5 The Ministry of Fisheries is responsible for managing the effect of fishing on the aquatic environment. Other agencies are responsible for factors such as pollution.

## Fish Stocks

5.035 A biological fish stock is a group of fish of the same species (such as orange roughy and snapper) that usually do not mix or breed with other groups of fish of the same species (or levels of mixing are very low). Generally, fish in the stock occupy a defined area.

5.036 Fisheries are managed on the basis of "administrative stocks" defined by quota management areas (QMAs). The boundaries for these administrative stocks may not necessarily match biological fish stock boundaries. For example, a fish species may be made up of two biological stocks, but is treated as one stock for administrative purposes. In the 1996 Act the term *fish stock* is used in the administrative sense. In this report we use *Fishstock* to denote an administrative fish stock to differentiate from a biological fish stock.

5.037 The Fishstocks are managed by setting limits on the total catch that is allowed in any fishing year, and the total allowable commercial catch.

## Total Allowable Catch

5.038 The total allowable catch (TAC) is set according to legislation. It may be set at less than the sustainable yield to rebuild the Fishstock, or more than the long-term sustainable yield if the stock is to be reduced by fishing.

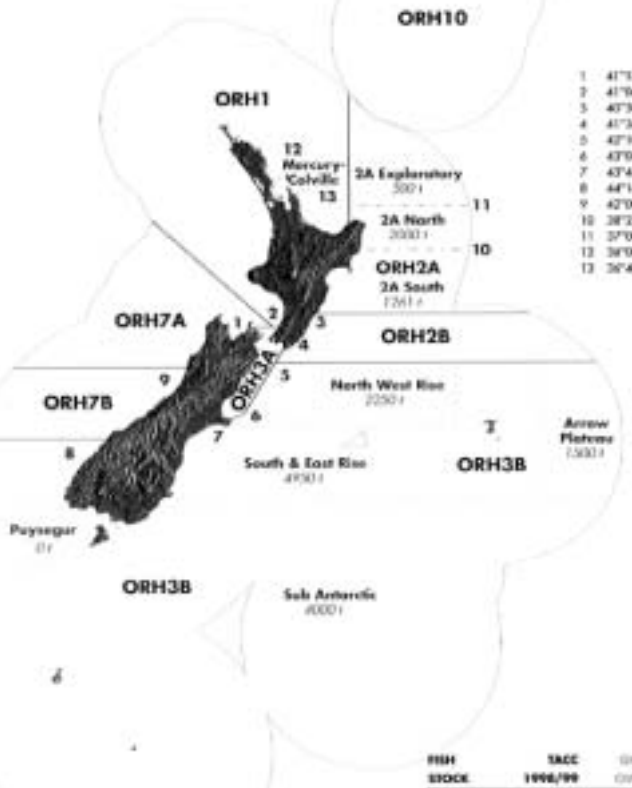
5.039 The TAC includes removal by all users – commercial, recreational, and customary – and other removals such as illegal take. The quantity of fish taken illegally and by non-commercial users can be significant in certain Fishstocks.

5.040 Recognising the importance of non-commercial users, section 12 of the 1996 Act requires the Crown to consult with stakeholders on the sustainable management of fisheries and the aquatic environment.[6] Non-commercial users include:

6 Appendix 2 on page 101 details the consultation requirements of the 1996 Act.

# ORANGE ROUGHY

*Hoplostethus atlanticus*




| | | | |
|---|---|---|---|
| 1 | 41°13.0'S | 174°19.4'E | |
| 2 | 41°06.0'S | 174°50.0'E | |
| 3 | 40°30.0'S | 176°33.0'E | |
| 4 | 41°36.8'S | 175°16.4'E | |
| 5 | 42°10.0'S | 174°47.7'E | |
| 6 | 43°08.0'S | 173°57.0'E | |
| 7 | 43°44.3'S | 173°07.5'E | |
| 8 | 44°16.0'S | 168°03.0'E | |
| 9 | 42°06.0'S | 171°24.0'E | |
| 10 | 38°22.0'S | | |
| 11 | 37°08.0'S | | |
| 12 | 36°08.0'S | 174°25.0'E | |
| 13 | 36°40.0'S | 176°50.0'E | |

| FISH STOCK | TACC 1998/99 | QUOTA OWNED | QUOTA HELD |
|---|---|---|---|
| ORH1 | 1 990.000 | | |
| ORH10 | 10.000 | | |
| ORH2A | 3761.000 | | |
| ORH2B | 250.600 | | |
| ORH3A | 980.200 | | |
| ORH3B | 12700.000 | | |
| ORH7A | 1,401.000 | | |
| ORH7B | 430.000 | | |
| TOTAL | 20354.800 | | |

- ***Customary Fishers***. Tangata whenua have long-standing customary ties with fisheries and these are recognised in law.[7] There are regulations governing the taking of fish for customary purposes and these give iwi, hapu, or whanau the opportunity to manage fisheries in specified areas. Customary fishing regulations give recognition to the sustainability concept. Where the customary catch is large, data gathering on a regular basis may be necessary. Where the customary catch is habitually small, information may be required less frequently.

- ***Recreational Fishers***. Fish species such as snapper are very popular with recreational fishers, and in some areas the recreational catch is a significant part of the total catch. In order to estimate the size of the recreational catch in areas where the recreational catch is significant, data may be obtained on a regular basis from surveys. For example, the snapper fishery in the north-eastern QMA (SNA1 – East Northland, and Hauraki Gulf/Bay of Plenty) had total commercial landings (1997) of 5,049 tonnes. Recreational fishers were asked to keep diaries recording their catches and, based on these diaries, it is estimated that recreational fishers landed around 2,300 tonnes of snapper for the same year.

5.041 Other removals occur through illegal fishing. It is suspected that for some species (such as paua) illegal fishing represents a significant proportion of the total catch in some QMAs. Hence, in setting TACs for some species it is necessary to take into account estimates of illegal catch.

## Maximum Sustainable Yield

5.042 The Minister set the TAC with reference to the maximum sustainable yield (MSY). The 1996 Act defines "maximum sustainable yield" as:

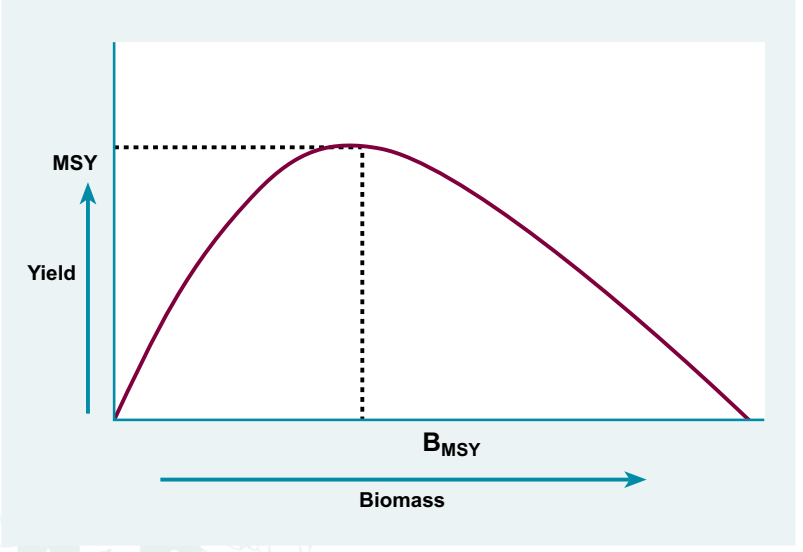
> *Maximum sustainable yield, in relation to any stock, means the greatest yield that can be achieved over time while maintaining the stock's productive capacity, having regard to the population dynamics of the stock and any environmental factors that influence the stock.*

7 The Fisheries Act 1996 defines tangata whenua as the hapu, or iwi, that is Māori and holds mana whenua (customary authority in an identified area) over that area.

5.043 Section 13 of the 1996 Act requires the Minister to set a TAC that either maintains the Fishstock at, or moves it towards, a size at or above a level which can produce the MSY. The term $B_{MSY}$ is the stock biomass at which MSY is taken and is the target reference point for stock biomass. The Minister must have regard to relevant social, cultural and economic factors – but such factors only qualify the rate at which the stock size is to be moved towards $B_{MSY}$, not the target stock size.

5.044 A fish stock that has never been fished is said to be at the *virgin* or *unfished biomass* ($B_0$). Even in the absence of fishing, the stock size will fluctuate naturally because of factors such as changes in sea temperatures, predation, food availability, and changes in ocean currents. Other influences may include man-induced factors such as the pollution of breeding grounds.

*Figure 5.1*
*Fish Stock Yield Curve*



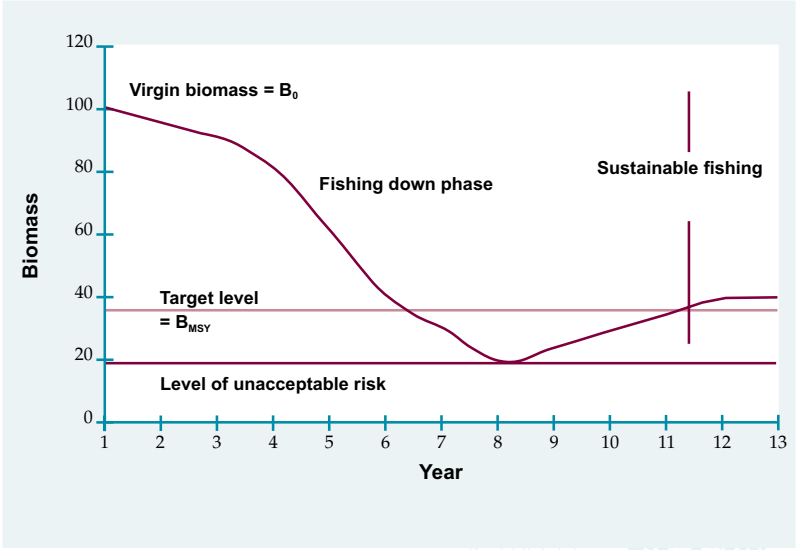

5.045 Within this particular model of fish population dynamics, when fishing of the stock begins the stock tends to compensate for the removal of fish by becoming more productive. However, there comes a point where the

overall productivity of the stock decreases because the biomass is too small and the yield decreases. This is represented in the basic yield curve shown in Figure 5.1 opposite.

5.046 The scientists we interviewed noted that the point at which the sustainable yield is at its maximum is usually around 30%-40% of the virgin biomass ($B_0$).

5.047 It is difficult to determine accurately the stock size below which the risk to the sustainability of the stock increases to unacceptable levels. Stock assessment scientists typically use 20% of $B_0$ as a benchmark of minimum sustainable stock size. Below this level, there is an increased risk that recruitment to the fish stock may be insufficient to balance removals from the fishery. This is illustrated in Figure 5.2.

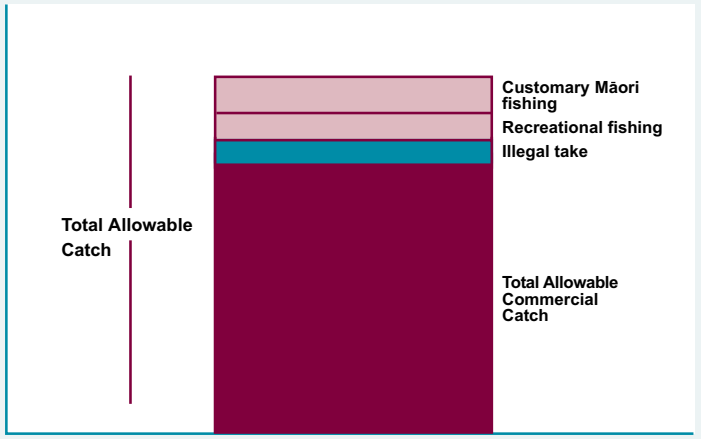
*Figure 5.2*
*Representative Biomass*




## Total Allowable Commercial Catch

5.048 Having set the year's TAC, the 1996 Act requires a total allowable commercial catch (TACC) to be established. The TACC is the portion of the TAC that can be taken by the commercial sector. The relationship between the TAC and TACC is illustrated in Figure 5.3 on the next page.

*Figure 5.3*
*Total Allowable Catch*




5.049 There are no overall limits on the quantity of fish that can be taken by non-commercial fishers. Daily bag limits and controls on fishing gear used influence how much is taken on any day by an individual but do not control overall take. The TACC, therefore, is set with an inexact estimate of the likely non-commercial take.

5.050 The primary control on the commercial fishery is the quota management system. A TACC limits how much individual fishers can take. (There are also some size limits, closed areas and gear restrictions – however, these are generally not designed to limit overall catch but to protect small animals, and prevent wastage.)

5.051 Monitoring the state of Fishstocks and ensuring compliance with controls are the major requirements in ensuring the sustainability of fisheries.

## Quota Management System

5.052 In the past, there were few restrictions on the amount of fish that could be taken. During the 1970s and early 1980s the amount of fish caught dramatically increased, causing

growing concern over the state of the inshore fisheries. Fish stocks were being depleted and there was a danger that fishing was heading towards biological and economic collapse. It was against this background that a quota management system (QMS) was introduced under the Fisheries Amendment Act 1986.

5.053 All of the TACC was divided up into Individual Transferable Quotas (ITQs). ITQs were allocated to companies or individuals and represented a right to catch a specified quantity of fish each year within a defined quota management area. New Zealand was one of the first countries to introduce such a system. The QMS was intended to assist with rebuilding inshore fish stocks and ensuring that catches were limited to levels that could be sustained over the long term.

5.054 Changes have been made to the operation of the QMS since it was first introduced. These include the ITQ specifying a percentage of the TACC rather than an absolute quantity, and the introduction of more species into the QMS. Currently, the QMS applies to 42 fish species (or groups of species) managed as 257 separate Fishstocks.

5.055 The QMS operates as follows. Where possible, scientific estimates are made each year of the population of the commercial fish species. Using this information – together with advice from the Ministry and information from the fishing industry – the Minister sets an annual TAC limit for each Fishstock. The TAC is designed to move the stock to a size at or above that which will produce MSY. Before setting the TACC the Minister must take into account:

- Māori customary non-commercial interests;
- recreational interests; and
- all other mortality to that stock caused by fishing.[8]

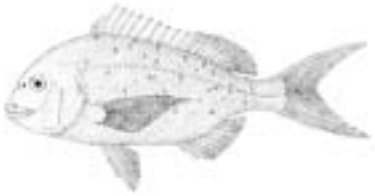
5.056 The TACC is set as the quantity (in tonnes) allowed to be caught commercially each year – which can vary from year to year. The TACC is divided into a number of ITQs. An ITQ is the right to catch a quantity of fish (specified as a

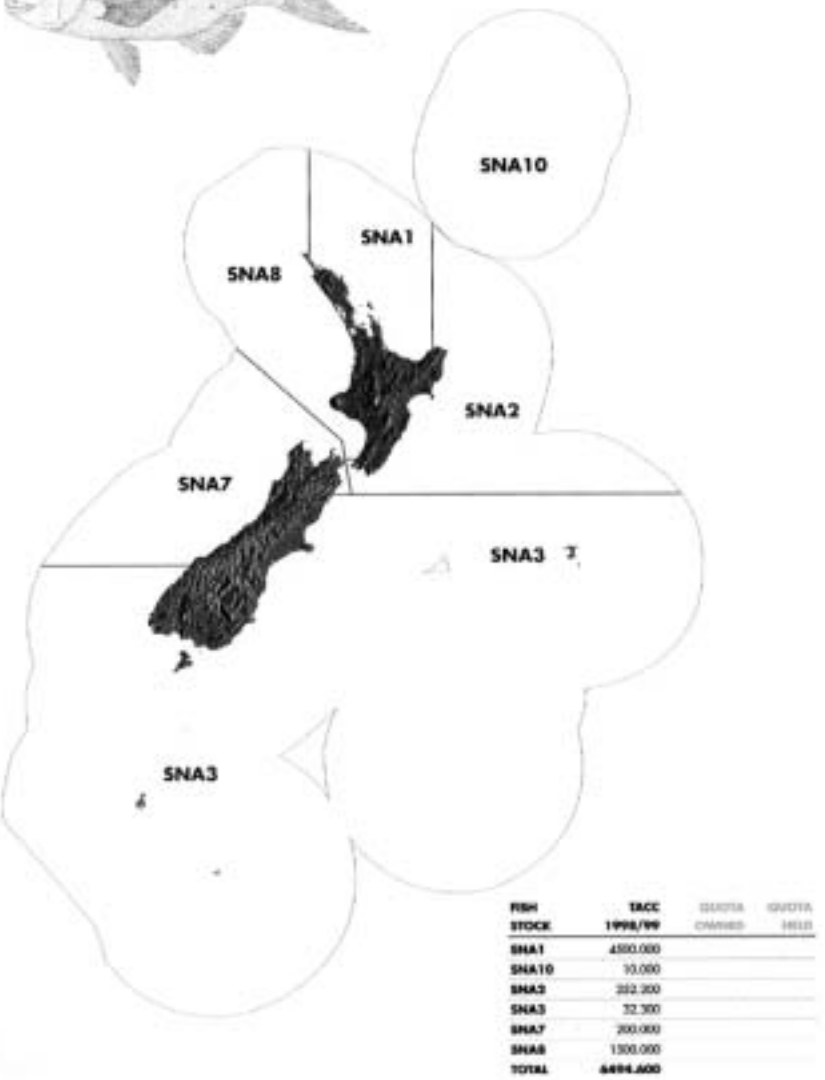
8 "Other mortality" includes illegal fishing and incidental mortality resulting from fishing operations (such as from burst nets).

## SNAPPER

*Pagrus auratus*

Tamure






| FISH STOCK | TACC 1998/99 | QUOTA OWNED | QUOTA HELD |
|---|---|---|---|
| SNA1 | 4500.000 | | |
| SNA10 | 10.000 | | |
| SNA2 | 202.200 | | |
| SNA3 | 32.300 | | |
| SNA7 | 200.000 | | |
| SNA8 | 1300.000 | | |
| TOTAL | 6494.600 | | |

percentage of the TACC by weight) for a designated Fishstock during one fishing year. For example, if a quota holder has quota for 6% of the TACC for a species in a quota management area, the quota holder will always be allocated 6% – but the quantity of fish that can be taken will vary each year as the TACC changes.

## Setting Total Allowable Catch to Maximum Sustainable Yield

5.057 As already stated, the 1996 Act requires Fishstocks to be managed at or above the biomass producing their maximum sustainable yield. The TAC is set so as to move the stock to, or maintain it at or above, this level. In fulfilling this requirement there is a demand for certain information. The following paragraphs describe:

- the information that is required;
- how it can be obtained; and
- who can collect certain types of data.

## Determining Stock Status

5.058 Fish stocks are complex natural living systems that are vulnerable to the effects of both human interventions (through fishing, pollution, and destruction of fish habitats), and natural environmental and ecological events. A 1998 report – *Improving Fish Stock Assessments* – by the Ocean Studies Board[9] commented that:

> *Matching fishing activities with natural fluctuations so as to avoid unsustainable harvests and population crashes is an important goal. In an ideal world, accurate and precise estimates of the abundance of fish stocks, how and why population levels change, would be available to set sustainable levels to accommodate commercial and recreational demand. In reality, fishery management is based on imperfect estimation of the number, biomass, productivity and age structure of populations.*

9 Commission on Geosciences, Environment, and Resources National Research Council (USA). ISBN 0 3 09057256.

5.059 Obviously, there is an incomplete scientific understanding of all the complex biological, ecological, and environmental factors that affect a fish stock. Nevertheless, the Minister is required to decide, on an annual basis, the quantity of fish that can be taken from each stock. For this reason, assessments have to be made of the likely size of each stock and its productivity. This is expressed in terms of *biomass* – the likely total weight of the stock.

5.060 Biological assessments are carried out to assess the biomass and productivity of a fish stock and changes to the biomass. The Ministry commissions research to obtain information on biomass levels and a range of other factors important in assessing stock dynamics and status. Two main data sources are used in these assessments – fishery independent data and fishery dependent data.

## *Fishery Independent Data*

5.061 Fishery independent data-collection methods are acoustic surveys, trawl surveys, dive surveys, and egg surveys. Fishery independent data does not rely on information obtained from commercial fishing operations.

## *Fishery Dependent Data*

5.062 Commercial fisheries are heavily regulated. All fishers have to submit regular reports on when and where they fished, how much of each species they caught, and other details. The data collected by commercial fishers can provide important information on the state of the fishery. In some fisheries it may be the only data that is available.

5.063 The fishery dependent data collected includes:

- date and time of fishing;
- species targeted and weight of catch;
- by-catch species caught and weight of catch;
- method of fishing;
- trawl speed;

- location and depth; and
- water temperature.

5.064 Some of this data can form indicators for use in fisheries management. Catch per unit of effort (CPUE) measures the amount of fish caught for a given amount of effort. If the ratio declines – that is, it becomes harder to catch fish – this may indicate a decline in abundance.

## *Other Data Sources*

5.065 In some parts of the country the catch taken by recreational fishers is a significant proportion of the total catch, so it is important to have data on recreational fishing for stock assessment. Recreational fishing is regulated to some extent – for instance, by placing limits on the size of the fish that may be taken, how much a person can catch of each species each day, or what type of fishing gear can be used. However, recreational fishers are not required to report their catch, nor is an overall recreational fishing catch limit set.

5.066 A number of telephone and diary surveys have been undertaken since 1991 to estimate the recreational catch. In these surveys, a group of randomly chosen recreational fishers is asked to complete diaries recording their catch for the year. The telephone survey was used to estimate the proportion of people involved in recreational fishing.

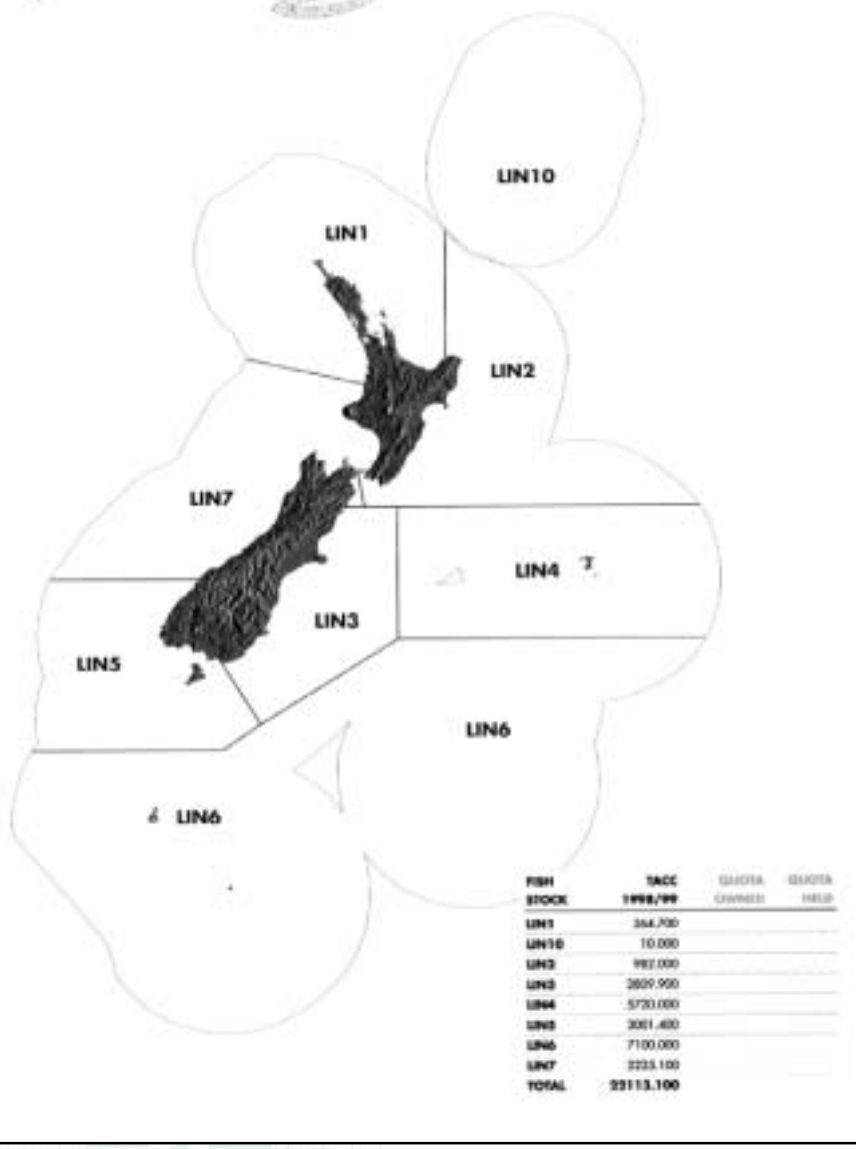
5.067 As with recreational fishing, customary Māori catch has not been fully reported. However, under new regulations introduced in 1998 people responsible for approving the customary take will be required to report four times a year to the Ministry, providing information on:

- the species authorised for harvest;
- the quantity authorised for harvest;
- the actual quantity harvested; and
- where the species was harvested.

# LING

*Genypterus blacodes*

**Hoka**




| FISH STOCK | TACC 1998/99 | QUOTA OWNED | QUOTA HELD |
|---|---|---|---|
| LIN1 | 364.700 | | |
| LIN10 | 10.000 | | |
| LIN3 | 982.000 | | |
| LIN5 | 2609.900 | | |
| LIN4 | 5720.000 | | |
| LIN5 | 3001.400 | | |
| LIN6 | 7100.000 | | |
| LIN7 | 3225.100 | | |
| TOTAL | 23113.100 | | |

## Stock Assessment Models

5.068 Information from the various data sources described above is used in stock assessment models. The Ministry purchases scientific expertise to construct these mathematical models to estimate:

- the current status of the fish stock;
- the rate of removal due to fishing; and
- the abundance needed to sustain the stock in the future.

5.069 Fisheries management is heavily dependent on models and statistical analysis to integrate available data on the state of a stock. Proposed models are subject to a system of scientific peer review. As part of this review process, the Ministry organises a system of Fishery Assessment Working Groups – which bring together scientists and other interested persons from sector groups (such as the fishing industry, environmental groups, recreational groups, and Māori groups) – to discuss the assessments of particular stocks.

5.070 The overall objective of the stock assessment process is to determine the state of each fish stock relative to specific reference points based on $B_{MSY}$.

## Information Requirements and Management Regime

5.071 In examining the different types and sources of information required for setting the TAC and the TACC it is important to be mindful of the trade-offs between the management regime in place and the information requirements.

5.072 Conservative management of fisheries may require less precise and less frequently collected data about a Fishstock – compared with an active management regime that seeks to maximise the sustainable yield of a fish stock.

5.073 Different combinations of harvest controls (catch limits and others) and information collection (data collection, analysis, etc.) will produce different levels of risk. The key concern is to manage the fisheries resource within an acceptable level of risk.

5.074 Some of the scientists we interviewed believed that there was a need for more accurate and precise measures of a stock's abundance as the stock was fished down.

5.075 Where a conservative management approach has been taken, in some cases the fishing industry has the option to fund additional research to prove that a Fishstock is able to cope with an increase in TACC.

5.076 While we acknowledge that conservative management may need less frequent information, it still requires sufficient information to demonstrate that the stock is being managed sustainably.

## The Research Planning Process

5.077 The Ministry of Fisheries research planning process is detailed below. There are three main inputs into this process:

### *Ministry of Fisheries Regional Liaison Networks*

5.078 The Ministry's regional policy groups meet with stakeholders to determine the research needs and requirements of stakeholder organisations at the regional level. This information can be fed into the later stages of the research planning processes.

### *Research Planning Groups*

5.079 The research planning groups are comprised of Ministry policy staff, representatives of approved parties, other government departments, and science providers.

5.080 The purpose of these groups is to discuss, evaluate, and recommend future research activity within the specific research area covered by the group. The proposed research activity includes strategic research plans, medium-term research plans, and research projects for the following year.

### *Research Co-ordinating Committee*

5.081 The purpose of the Research Co-ordinating Committee is to discuss, evaluate and co-ordinate the development of, and recommend proposed future, research activity. It is composed of representatives of the parties approved for consultation on the nature and extent of required fisheries services, together with science providers and Ministry staff.

5.082 Standards of determining the priorities for research for the 1999-2000 year were developed by the Ministry and distributed to members of the Research Co-ordinating Committee for written comment. As a result of this consultation, the Ministry produced a list of standards and criteria that are to be considered when evaluating proposals and determining priorities for research for the following year.

## Strategic Direction for Fisheries Research

5.083 The Ministry outlined its strategic intent for fisheries research in a paper *Strategic Framework and Directions for Fisheries Research Contracted by the Ministry of Fisheries, July 1998*. The paper noted that:

> *Determination of the specific directions for research will require the development of effective consultation with stakeholders, the application of robust priority-setting criteria, and consideration of the quality and cost-benefit of the research.*

5.084 This strategic approach is evidenced by the Ministry (in conjunction with stakeholders) developing a series of medium-term research plans for particular species, fisheries, or research areas. The plans integrate individual related projects on the specific research topic over the medium term (three to five years). The plans list the proposed projects for the following fishing year, as well as the research needs and directions for the subsequent two to four years.

5.085 The Ministry undertakes a cost-benefit analysis of each research project and, in consultation with stakeholders, establishes the priority of each project (high, medium, or low). This allows the research to be targeted at the areas of highest risk and largest pay-off.

5.086 It is important to acknowledge that the Ministry is required to manage New Zealand's fisheries even if it does not possess the information required by the 1996 Act. Therefore, while the Ministry may seek to obtain more information, it must manage with the information that it has at its disposal.

**Research vessel "Tangaroa"**

# Sustainable Utilisation of Fisheries

## Limitations of the Scope of Fisheries Research

5.087 Generally, New Zealand fisheries management has been based on stock assessment research into single species.[10] The primary research focus has been on hoki, orange roughy, rock lobster, and snapper – four of the eight species we chose to examine in this audit.

5.088 The concentration of research on a small number of commercially important fish species has resulted in other quota management species receiving little or no stock assessment research attention. The Ministry's priority is with establishing the status of the major (single species) fisheries resource. It has also allowed for very little research on stock or ecosystem dependencies.

5.089 In our 1990 joint report we noted that a consequence of narrowly focused research was that there was no developing knowledge base of the minimum essential information for every stock. We believe that this situation has not changed greatly. The Ministry told us that the relative risk of each stock is assessed to determine research priorities.

## High Level of Uncertainty in Fishstock Information

5.090 The Ministry told us that it uses a risk-based research strategy which concentrates on those Fishstocks that are heavily fished. For other stocks the Ministry relies on a base of knowledge built from commercial catch data.

10 We acknowledge that recent reviews of the country's fisheries science capabilities have concluded that, although the quantity of science able to be carried out is limited, the quality of most aspects of fisheries science is high and (in some cases) world-leading.

*Figure 5.4*
*Status of Fishstocks*

| Species | Status of Fishstock in Relation to $B_{MSY}$ by Quota Management Area | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **7** | **8** | | | |
| Blue-nose | un-known | un-known | un-known | un-known | un-known | | | |
| | **1(WC)** | **1(EC)** | | | | | | |
| Hoki | above $B_{MSY}$ | above $B_{MSY}$ | | | | | | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | |
| Ling | un-certain | un-certain | above $B_{MSY}$ | above $B_{MSY}$ | above $B_{MSY}$ | above $B_{MSY}$ | un-certain | |
| | **1** | **2A North** | **2B** | **3A** | **3B** | **7A** | **7B** | |
| Orange roughy | above $B_{MSY}$ | above $B_{MSY}$? | below $B_{MSY}$? | below $B_{MSY}$? | below $B_{MSY}$? | un-certain | below $B_{MSY}$? | |
| | **1** | **2** | **3** | **4** | **5A** | **5B** | **5D** | **7** |
| Paua | un-known | un-known | un-known | un-known | un-known | below $B_{MSY}$ | un-known | un-known |
| | **1(NSN)** | **2(NSN)** | **3** | **4** | **5** | **6** | **7** | **8** |
| Rock lobster | above $B_{MSY}$? | above $B_{MSY}$? | un-known | above $B_{MSY}$ | above $B_{MSY}$ | un-certain | below $B_{MSY}$ | below $B_{MSY}$ |
| | **1 (North)** | **1 (Gulf/ Bay)** | **2** | **7** | **8** | | | |
| Snapper | above $B_{MSY}$ | below $B_{MSY}$ | sustain-able | sustain-able | below $B_{MSY}$ | | | |
| | **1T/1J** | **6T** | | | | | | |
| Squid | un-known | un-known | | | | | | |

Note: 1. A query (?) is used where the stock is probably above/below MSY or probably sustainable.

2. ***Unknown*** or ***uncertain*** is used where the status of the stock is described as ***not known*** or ***uncertain*** by the Ministry in *Report from the Fishery Assessment Plenary, May 1999: stock assessments and yield estimates.*

3. This table excludes nominal stocks (e.g. Kermadecs, Paua 6).

5.091 An information paper *Science for Sustainable Fisheries*, prepared for the Ministry of Research, Science and Technology by the National Institute of Water and Atmosphere Research in October 1996, highlighted gaps in key information for many QMS species.

5.092 In the period since preparation of *Science for Sustainable Fisheries* more information for the management of stocks has been gathered. Figure 5.4 summarises the status of the stocks as apparent in *Report from the Fishery Assessment Plenary, May 1999: stock assessments and yield estimates*.[11]

5.093 Figure 5.4 shows that the status of 31 of the 44 Fishstocks (in terms of $B_{MSY}$) that we examined was not known with any certainty. Therefore, even for some of the most important Fishstocks (socially, economically, and culturally) the Ministry cannot be certain that the stocks are being utilised to their potential (MSY) or, in some cases, being utilised sustainably. We note, however, that for New Zealand's largest commercial species, hoki, the status is known and catches appear to be sustainable.

5.094 **We recommend that the Ministry:**

- **recognises and addresses the level of uncertainty of the status of Fishstocks in its annual research and management documents.**

## Management with Limited Information

5.095 The Ministry told us that the lack of certain information does not mean that it does not and cannot manage Fishstocks.

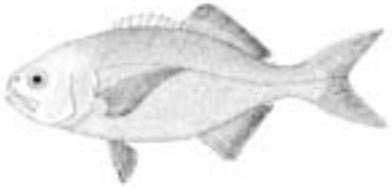
5.096 In Appendix 3 on pages 102-112 we summarise some of the key information held for each of the eight species we assessed. This outlines the base of information that exists with which to manage the Fishstocks. Information includes recruitment, growth rates, mortality, indicators of relative abundance, and stock assessment modelling.

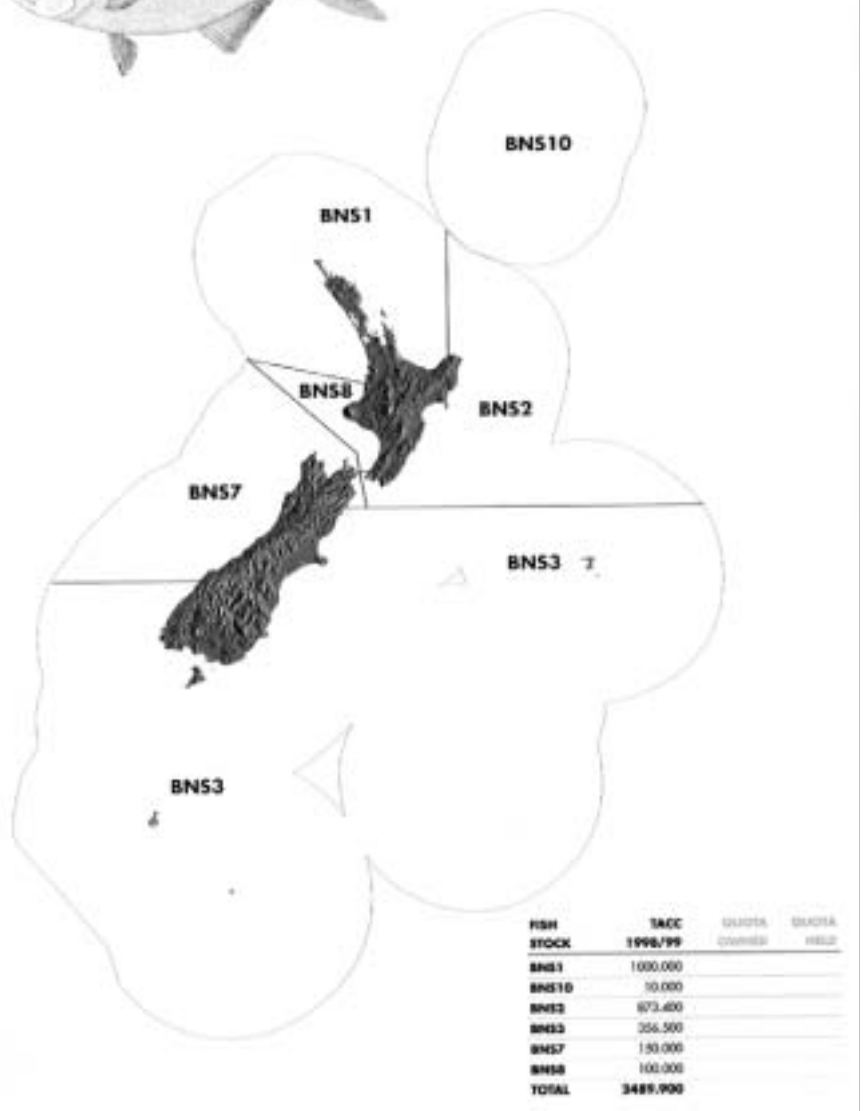
11 Rock Lobster is presented in *Report from the Mid-Year Fishery Assessment Plenary, November 1998: stock assessments and yield estimates.*

## BLUENOSE

*Hyperoglyphe antarctica*

**Matiri**






| FISH STOCK | TACC 1998/99 | QUOTA OWNED | QUOTA HELD |
|---|---|---|---|
| BNS1 | 1000.000 | | |
| BNS10 | 10.000 | | |
| BNS2 | 673.400 | | |
| BNS3 | 256.500 | | |
| BNS7 | 150.000 | | |
| BNS8 | 100.000 | | |
| TOTAL | 3489.900 | | |

5.097 The Ministry has also adopted management techniques that can be used for certain stocks where information is uncertain or incomplete. These include:

- ***Voluntary closure***. This is used in the Orange Roughy 3B Puysegur area with the support of the fishing industry.
- ***Commercial exclusions***. Such exclusions include the "43 metre rule" which limits the size of boats that are allowed to fish close to the coastline to 43 metres in length, and prohibits the use of certain fishing techniques in designated areas (such as trawling in harbours).
- ***Decision rules***. An example is the rule adopted for the southern rock lobster fishery. The rule is designed to rebuild the stock to $B_{MSY}$ by the year 2015 and may require a series of TACC cuts. These cuts will be agreed with all stakeholders including quota holders.
- ***Adaptive management***. The adaptive management approach is learning from trial and error – such as increasing a TACC and then changing it if necessary. This approach was undertaken in the ling fishery and is currently used in ORH 1 and for a range of inshore species.

5.098 Managing Fishstocks with limited or no information on their status may not necessarily pose a risk to a particular Fishstock. However, we believe that without such information the Ministry is unable to determine if the Fishstock is being managed towards or at a level that can produce maximum sustainable yield, as required by the 1996 Act .

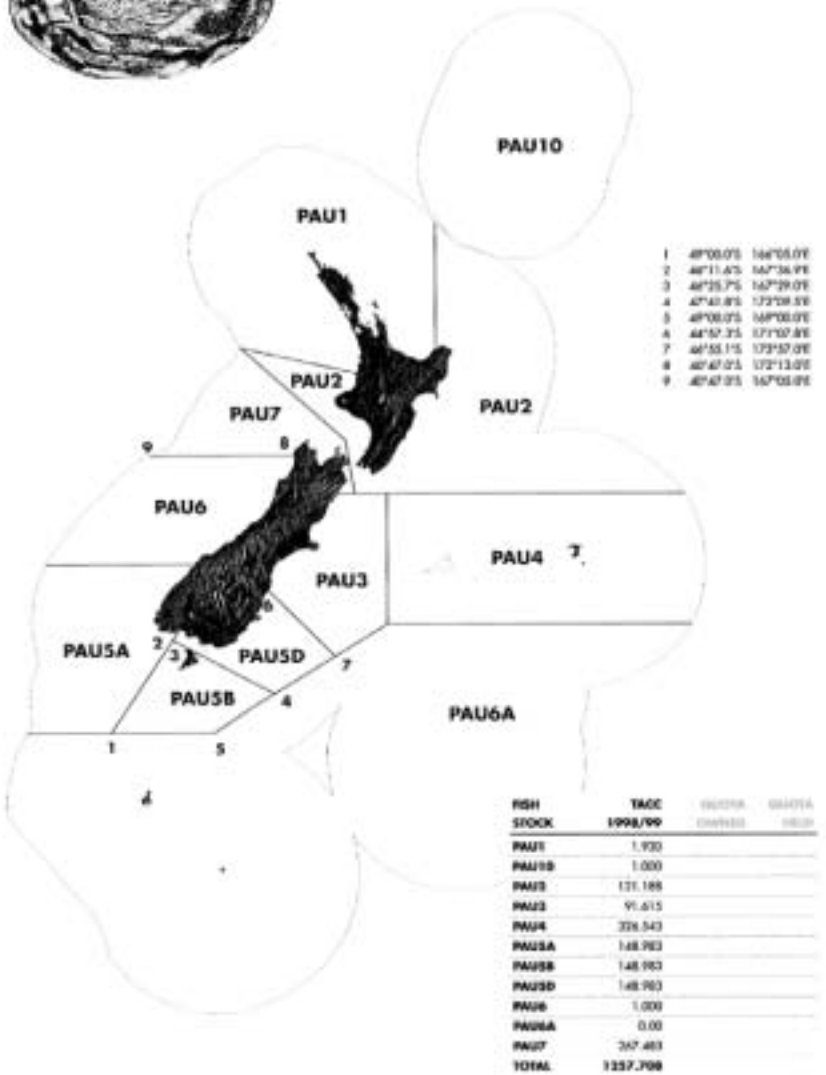
## The Aquatic Environment

5.099 Ecosystem processes and variability in environmental parameters are inter-related and will affect, and be affected by, the distribution and abundance of fish populations. The 1996 Act highlights an ecological approach to fisheries management. In particular, the Act requires avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment.

## PAUA

*Haliotis iris, Haliotis australis*

Paua




| | | |
|---|---|---|
| 1 | 48°00.0'S | 166°05.0'E |
| 2 | 46°11.6'S | 167°36.9'E |
| 3 | 46°25.7'S | 167°29.0'E |
| 4 | 47°43.8'S | 173°09.5'E |
| 5 | 48°00.0'S | 168°00.0'E |
| 6 | 44°57.3'S | 171°07.8'E |
| 7 | 44°55.1'S | 173°57.0'E |
| 8 | 40°47.0'S | 172°13.0'E |
| 9 | 40°47.0'S | 167°05.0'E |

| FISH STOCK | TACC 1998/99 |
|---|---|
| PAU1 | 1,930 |
| PAU10 | 1,000 |
| PAU3 | 131.188 |
| PAU2 | 91.615 |
| PAU4 | 328.543 |
| PAU5A | 148.983 |
| PAU5B | 148.983 |
| PAU5D | 148.983 |
| PAU6 | 1,000 |
| PAU6A | 0.00 |
| PAU7 | 267.483 |
| TOTAL | 1357.708 |

5.100 In 1996 the Ministry released to all stakeholders a document called *Changing Course – Towards Fisheries 2010*, which provides a framework to help define the Ministry's strategy. One of the key themes in the document is the Ministry's objective that *to effectively manage our fisheries we must manage fish in the context of the environment in which they exist, that is, a management approach based on the ecosystem.*

5.101 Given the importance of the aquatic environment in the management of fisheries, we expected that the Ministry would be working to meet the environmental and sustainability principles in sections 9, and 11 (a) and (c) of the 1996 Act by taking into account:

- associated or dependent species;
- biological diversity of the aquatic environment;
- habitat of particular significance;
- effects of fishing on any stock and the aquatic environment; and
- natural variability of stock.

5.102 We describe in the left column of Figure 5.5 (on pages 90-91) the information that we believe would be necessary for the Ministry to meet those requirements and formulate recommendations to the Minister. We assessed the level of knowledge about the impacts of fishing on aquatic environment in relation to the eight species in our audit. Our assessment is indicated in the centre column of Figure 5.5, headed "Current situation". We have also identified the Ministry's plans to improve the information in this area (the right-hand column of Figure 5.5, headed "Proposed situation").

5.103 Figure 5.5 highlights that some research has begun and further research is planned in most of the areas that we have identified as critical to fulfilling the environmental requirements of the 1996 Act. The Ministry developed a medium-term research plan for the aquatic environment in September 1998.[12] The plan highlights that since 1996 research has been commissioned to estimate non-fish

12 The plan also notes related research which is funded by the Foundation for Research, Science and Technology and the Department of Conservation.

## *Figure 5.5*
## *Information Needed to Meet Aquatic Environment Requirements*

| Our view of the information required to meet aquatic environment requirements | Current situation | Proposed situation |
|---|---|---|
| ***Habitats of significance***<br>All habitats of significance to a fishery are identified and defined (may be different habitats, one for spawning, one for larval development, etc.). | Some known spawning grounds, such as for snapper, are closed. Some harbours are closed to certain types of commercial fishing. However, no habitats of significance have been formally defined or documented. | Research is planned (Oct 1999-Sept 2000) to determine areas of habitats of importance to fisheries management within the EEZ for selected fish species in selected areas.<br>This includes determining areas of importance for:<br>• juveniles; and<br>• spawning. |
| ***Dependent stocks***<br>Vulnerable associated and dependent stocks are identified. | Some non-target by-catch is recorded. However, there is no comprehensive definition or documentation of associated and dependent fish species. | Research is planned (Oct 1999-Sept 2000) on the estimation of non-target fish catch.<br>This is an ongoing programme – some work has already been done. Utilising data already available in the Ministry's database, a quantitative estimate will be made of the catch of non-target species to be used to assess the potential impact of fishing on associated and dependent fish species. |
| Regular estimates of the abundance of the dependent and associated stocks are made. | None documented. | Research is planned (Oct 1999-Sept 2000) to identify trends in abundance of associated or dependent species from selected commercial fisheries. This is specifically to examine two recently developed deepwater and middle-depth fisheries (including invertebrates) on the Chatham Rise. |

| Our view of the information required to meet aquatic environment requirements | Current situation | Proposed situation |
|---|---|---|
| | | The Ministry believes that information is likely to be available from trawl surveys, scientific observer records, and commercial catch and effort data. |
| Estimates of fishing-related mortality of the dependent stocks are made. | Estimates of catch and discards have been undertaken for selected species. These can be used to assess the level of fishing induced mortality. | As above. |
| ***Aquatic environment*** An inventory of affected and vulnerable species in the aquatic environment is performed and key features of interaction are identified. | Research has been undertaken in 1997-98 and 1998-99 to estimate:<br>• non-fish by-catch;<br>• by-catch of non-target species; and<br>• discards in middle-depth and deepwater trawl fisheries. | Research is planned (Oct 1999-Sept 2000) to document and assess from existing sources the methods for protecting marine biodiversity from the impacts of fishing. This will require: a description of the main marine biotypes present within the EEZ; distribution of marine biotypes to determine areas that may be impacted by fishing, and levels of biodiversity; and how to maintain these. |
| In relation to the fishery, changes to the aquatic environment are identified. | No research has been carried out. | Research is planned (1999-2000) which may help identify changes to the aquatic environment. |
| The extent, reason and importance of these changes are assessed. | No reasons or importance of changes have been identified yet. | No research proposed. |
| If the change is important, and can be remedied, remedial action to protect the aquatic environment is planned or under way. | No remedial action has been carried out. | Research is planned (1999-2000) which will provide an understanding of, and document for management purposes, levels of biodiversity and how to maintain these. |

bycatch, non-target fish bycatch, and discards in selected fisheries. While the research commissioned by the Ministry is important, we believe that significantly more research is required to fulfil the environmental principles of the Act.

5.104 In our view the research that the Ministry has contracted on this subject has been limited. The environment principles of the 1996 Act have been well known for sometime. In 1992 a Ministerial Taskforce into fisheries management recommended the development of a set of environmental principles that established "bottom lines" for sustainability and took into account the ecological relationships among fish stocks. Furthermore, an ecosystem approach forms the basis of the Ministry's key strategic documents *Changing Course* (1996) and *Five Year Strategic Plan* (July 1998).

5.105 **We recommend that the Ministry:**

- **gives greater priority to fulfilling the environmental requirements of the 1996 Act.**

## Environmental Indicators

5.106 The Ministry for the Environment is developing a national system for reporting the state of the environment. This has been done in collaboration with other agencies – including the Ministry [of Fisheries] regarding the aquatic environment – and is known as the Environmental Performance Indicators Programme.

5.107 Environmental performance indicators are agreed measures designed to help track changes in the environment. The Ministry for the Environment intends to have a "tool box" of core environmental performance indicators available for use by the year 2000. This "tool box" will help in assessing the state of our environment and the success of our environmental policies and laws. The list of confirmed indicators for the marine environment was due by 30 June 1999, but has yet to be released publicly.

5.108 The Ministry [of Fisheries] has a role in managing the sustainable utilisation of fishing. Other agencies have complementary responsibilities, such as:

- marine mammals and seabirds (Department of Conservation);
- marine pollution (local authorities and the Maritime Safety Authority); and
- coastal land use (local authorities).

5.109 We are pleased to see a growing co-ordination of effort under the Environmental Performance Indicators Programme, which we hope will advance the nation's knowledge of, and help to manage, the marine environment.

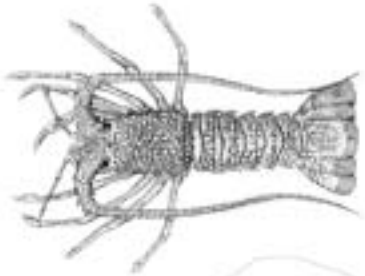
5.110 **We recommend that the Ministry:**

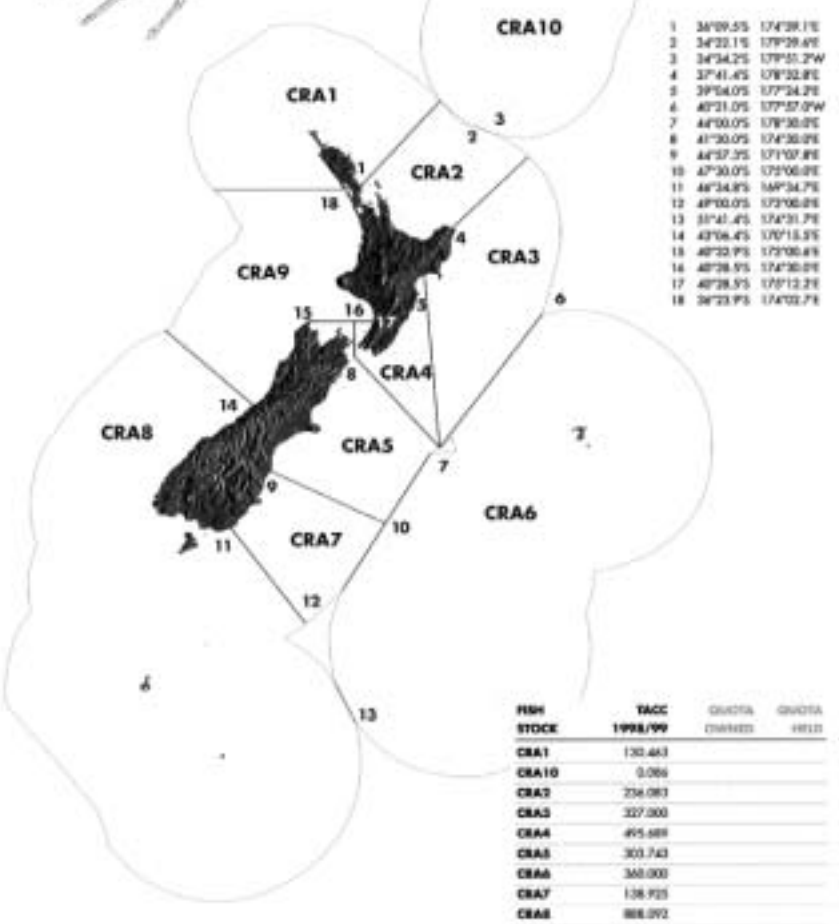
- **continues to work with the Ministry for the Environment on the Environmental Performance Indicators Programme.**

# SPINY (RED) ROCK LOBSTER

*Jasus edwardsii*

**Koura papatea**






| | |
|---|---|
| 1 | 34°09.5'S 174°39.1'E |
| 2 | 34°32.1'S 179°39.6'E |
| 3 | 34°34.2'S 179°51.2'W |
| 4 | 37°41.4'S 178°32.8'E |
| 5 | 39°04.0'S 177°24.2'E |
| 6 | 40°21.0'S 177°57.0'W |
| 7 | 44°00.0'S 178°30.0'E |
| 8 | 41°30.0'S 174°30.0'E |
| 9 | 44°57.3'S 171°07.8'E |
| 10 | 47°30.0'S 173°06.0'E |
| 11 | 46°34.8'S 169°34.7'E |
| 12 | 49°00.0'S 173°06.0'E |
| 13 | 51°41.4'S 174°31.7'E |
| 14 | 43°06.4'S 170°15.5'E |
| 15 | 40°32.9'S 173°00.6'E |
| 16 | 40°38.5'S 174°30.0'E |
| 17 | 40°38.5'S 173°12.2'E |
| 18 | 36°23.9'S 174°02.7'E |

| FISH STOCK | TACC 1998/99 | QUOTA OWNED | QUOTA HELD |
|---|---|---|---|
| CRA1 | 130.463 | | |
| CRA10 | 0.066 | | |
| CRA2 | 234.083 | | |
| CRA3 | 327.000 | | |
| CRA4 | 495.689 | | |
| CRA5 | 303.743 | | |
| CRA6 | 360.000 | | |
| CRA7 | 138.925 | | |
| CRA8 | 808.092 | | |
| CRA9 | 47.008 | | |
| TOTAL | 2937.089 | | |

# Ministry of Fisheries Research Budget

## Potential Overlap of Research Funding

5.111 We looked at fisheries research contracted by the Ministry to assist the Minister in making decisions for management measures – including the setting of TACs and TACCs. But there are other sources of funding for research relating to fishing and the aquatic environment. For example, the Foundation for Research Science and Technology funds research related to fisheries and aquaculture through the Public Good Science Fund.

5.112 There is potential overlap in the areas of research funded by the Ministry and the Foundation. However, the Ministry has reported that both organisations are working co-operatively to avoid duplication and to ensure compatibility and complimentarity of research funding.

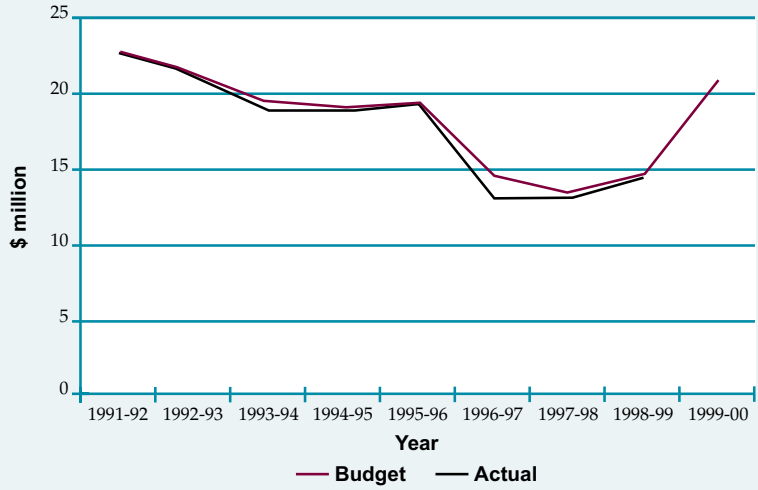
5.113 **We recommend that the Ministry:**

- **continues to work co-operatively with other research funders to avoid duplication and to ensure compatibility and complementary of research funding.**

## Reduction in Research Funding During Formulation of the 1996 Act

5.114 Figure 5.6 on the next page shows the budgeted and actual spending between 1991 and 2000. As can be seen, the fisheries research budget fell from $22 million in 1991-92 to $13 million in 1997-98. This year (1999-2000) the budget has gone back up to $20 million.

*Figure 5.6*
*Ministry of Fisheries Research Budget*
*1991-92 to 1999-2000*




5.115 We observe that the trend of decline in the budget from 1991 to 1998 coincided with the formulation of the 1996 Act which, we believe, demands more information for fisheries management than the 1983 Act. In light of our other findings the increase in the budget this year can be seen as encouraging.

5.116 On the other hand, species such as southern scallops, Nelson-Marlborough dredge oysters, and jack mackerel (FMA1 and 3) have been introduced into the QMS since 1990. Ten new species came into the QMS in October 1998 – requiring more information for fisheries management.

## Timeliness of Research

5.117 Some may argue that the research planning process has seen an increase in the focus and quality of research. However, we have seen no evidence that the benefits have been quantified.

5.118 Some stakeholders see the planning process as very time-consuming and the gap between planning and results too lengthy. Research projects that were agreed in planning meetings in mid-1998 will be conducted during 1999-2000 and the results will be published in the May 2001 *Plenary Report*.

## Research for the Future

5.119 The Ministry states in *Changing Course* that it needs *to set clear long-term goals for the management of fisheries*. However, while the current policy of giving priority to researching the most commercially significant species is understandable in the short term, the relative importance of species may change and other fish species may become more commercially significant.

5.120 At this stage there will be little fishery independent information available to assist the management of species which may become more important.

## Aquatic Environment Research

5.121 The 1996 Act and subsequent Ministry documents place heavy emphasis on an ecosystem approach to fisheries management. Consequently, we expected to see a commensurate investment in understanding and monitoring the effect of fishing on the aquatic environment.

5.122 The Ministry has budgeted $481,445 for research of the aquatic environment in the 1999-2000 financial year. Of that amount, over $52,000 *is advice and support*. The Crown's contribution to the research is to be $266,818 – the rest is to be paid for by the fishing industry.

5.123 The size of that budget means that it is not possible to conduct any research at sea. Rather, the research that is planned will comprise up to six desk-top studies analysing past catch information or undertaking literature reviews.

5.124 In our view, the lack of research contracted by the Ministry – and the short-term focus of the small amount committed to aquatic environment research – indicate that the Ministry (at present) has fallen short of the environmental principles of the 1996 Act.

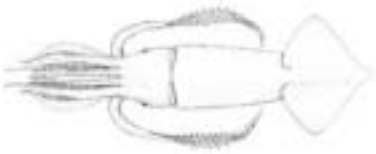
5.125 **We recommend that the Ministry:**

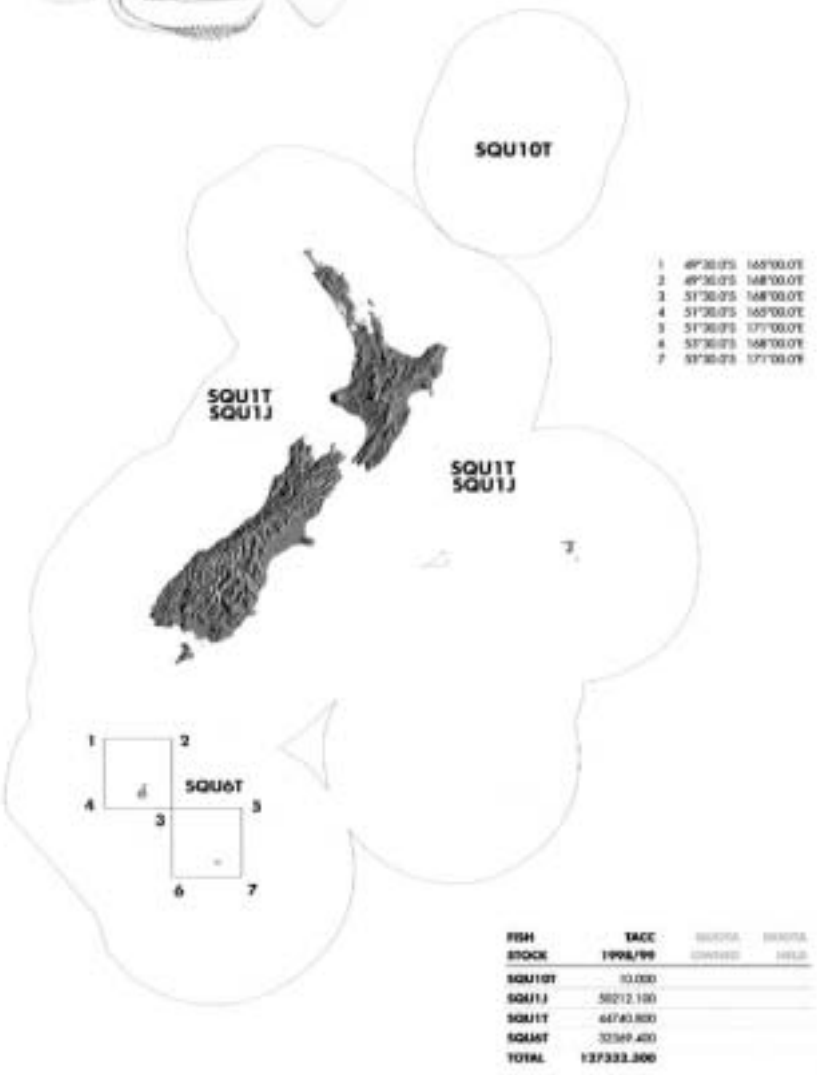
- **recognises in its budgeting the research required to fulfil the environmental principles of the 1996 Act.**

## SQUID

*Nototodarus gouldi, Nototodarus sloanii*

**Wheketere**






| FISH STOCK | TACC 1998/99 |
|---|---|
| SQU10T | 10,000 |
| SQU1J | 50212,100 |
| SQU1T | 64740,800 |
| SQU6T | 32369,400 |
| TOTAL | 137333,300 |

# Appendix 1

## Review of the Fisheries Act 1996

In early 1998 the Ministry (on behalf of the Minister) commissioned an independent review of the Fisheries Act 1996. In summary, the independent reviewer recommended:

- *a fundamental realignment of the roles of Government and fisheries stakeholders and the implementation of transparent consultation and decision-making processes;*
- *a simplified and less prescriptive operating regime than exists under the Fisheries Act 1996; and*
- *devolving to fisheries rightsholders the responsibility for fisheries management at the discretion of the Minister.*

# Appendix 2

## Consultation Requirements of the Fisheries Act 1996

Section 12 of the 1996 Act requires that, before doing anything under section 11(1) (which relates to sustainability measures), the Minister shall:

[*(1)*] *(a) Consult with such persons or organisations as the Minister considers are representative of those classes of persons having an interest in the stock or the effects of fishing on the aquatic environment in the area concerned, including Maori, environmental, commercial, and recreational interests; and*

*(b) Provide for the input and participation of tangata whenua having–*

*(i) A non-commercial interest in the stock concerned; or*

*(ii) An interest in the effects of fishing on the aquatic environment in the area concerned–*

*and have particular regard to Kaitiakitanga.*

*(2) After setting or varying any sustainability measure, the Minister shall, as soon a practicable, give to the parties consulted in accordance with subsection (1) of this section reasons in writing for his or her decision.*

# Appendix 3

## Stock-specific Information

| Species: Squid | Current Information |
|---|---|
| ***Stock hypothesis*** | The species live for about one year, spawn and die. |
| Biology<br>Productivity<br>Stock structure | The detailed structure of squid stocks is not fully understood. The two northern species are managed as one stock while the Auckland Islands shelf stock appears to be different to the mainland stock and is managed separately.<br>Details and location of spawning are not known.<br>Growth has been studied along with tagging experiments to establish how far squid can travel in a day. |
| ***Catch levels***<br>Catch versus quota<br>Recreational<br>Customary Māori<br>Illegal<br>Other sources of mortality | Total catch has not exceeded the TAC in the past 10 years. There is no quantitative information available on the level of customary Māori recreational, illegal or other sources of mortality. |
| ***Catch per unit of effort***<br>Catch rate | CPUE is not seen as practical for estimating relative abundance. |
| ***Abundance***<br>Biomass estimates<br>Techniques used | No estimates of current and reference biomass are available due to the biology of the species. There is also no proven method at this time to estimate yields from the squid fishery before a fishing season begins. |
| ***Monitoring***<br>Length/frequency<br>Age/length | None. |

| Species: Bluenose | Current Information |
|---|---|
| ***Stock hypothesis***<br><br>Biology<br>Productivity<br>Stock structure | It is not known whether more than one stock of bluenose occurs in New Zealand waters.<br><br>Little known about reproductive biology. No distinct spawning grounds are known. Growth studies have been completed. A tagging survey in BNS 2 indicated that bluenose may be sedentary in short term, although age specific migration may occur.<br><br>Information on biology based on research in QMA 2. |
| ***Catch levels***<br><br>Catch versus quota<br>Recreational<br>Customary Māori<br>Illegal<br>Other sources of mortality | In 1996-97 reported landings exceeded the TACC in two bluenose stocks (BNS 2 and 3).<br><br>The levels of recreational catch are estimated from telephone/diary surveys. No quantitative information on illegal take, customary Māori and other sources of mortality. |
| ***Catch per unit of effort***<br><br>Catch rate | CPUE is analysed as a possible means of monitoring the stock abundance in BNS 1 and 2 but not in BNS 3,7,8.<br><br>CPUE is a factor in the decision rules for the adaptive management programme in BNS 1. |
| ***Abundance***<br>Biomass estimates<br>Techniques used | No estimates of current biomass available for any stock. It is not known if recent catch levels or the current TACC are at levels that will allow the stock to move towards a size that will support the maximum sustainable yield. |
| ***Monitoring***<br>Length/frequency<br>Age/length | Four bluenose stocks (BNS 1,3, 7 and 8) are managed under an adaptive management programme.<br><br>An updated stock assessment for BNS 2 is due in 1999. |

| Species: Paua | Current Information |
|---|---|
| ***Stock hypothesis***<br>Biology<br>Productivity<br>Stock structure | The present Fishstock boundaries may not represent discrete paua stocks. However, adjustment of statistical areas and the collection of fine-scale catch and effort data will allow a better understanding of paua stocks.<br>Growth studies have been completed.<br>Recruitment studies have been undertaken. |
| ***Catch levels***<br>Catch versus quota<br>Recreational<br>Customary Māori<br>Illegal<br>Other sources of mortality | No paua Fishstock TACC was exceeded in 1996-97. For PAU 5B the current biomass is less than the size that will support MSY. For all other Fishstocks it is not known if recent catch levels or the current TACC are at levels that will allow the stock to move towards a size that will support the maximum sustainable yield.<br>Current levels of Māori customary take not quantified.<br>Some estimates of recreational take are available.<br>Paua are taken illegally, sometime in large quantities. |
| ***Catch per unit of effort***<br>Catch rate | However, in some cases commercial CPUE may not be proportional to abundance as it is possible to maintain catch rates despite a falling biomass.<br>Fishers were due to start recording fine-scale catch and effort data in their log books from October 1999. |
| ***Abundance***<br>Biomass estimates<br>Techniques used | The Ministry has proposed a 33 month stock assessment project which will include estimating abundance and sustainable yield in major Fishstocks. |
| ***Monitoring***<br>Length/frequency<br>Age/length | Fishers were due to start recording fine-scale catch and effort data in their log books from October 1999. |

| Species: Ling | Current Information |
|---|---|
| ***Stock hypothesis***<br>Biology<br>Productivity<br>Stock structure | No comprehensive study of ling stock separation has been conducted but diverse information sources indicate that there are at least four ling stocks. A growth study from four areas has been completed.<br>Ling have been successfully aged and spawning conditions and localities are known. However, little is known about the distribution of juveniles. |
| ***Catch levels***<br>Catch versus quota<br>Recreational<br>Customary Māori<br>Illegal<br>Other sources of mortality | Landings in 1996-97 exceeded the TACCs in all Fishstocks except LIN 4. The significant TACC overrun in LIN 7 (36%) continues a trend apparent since 1988-89. (Ling is a bycatch of hoki trawlers.)<br>Recreational fishing surveys in Northern region (1993-94) have allowed an estimate of annual recreational catch from LIN 1. National diary survey (1996) estimated harvest was low.<br>No quantitative information on customary Māori catch.<br>The extent of any other sources of mortality is unknown. |
| ***Catch per unit of effort***<br>Catch rate | Standardised CPUE indices have been established for LIN 3, 4, 5, 6 and 7.<br>The development of target longline fisheries for ling in recent years on the Bounty Platform may allow CPUE to be used as an index of stock abundance. |
| ***Abundance***<br>Biomass estimates<br>Techniques used | Research is planned in 2000-2001 in LIN 3,4,5,6 and 7 which will include estimating biomass and sustainable yields.<br>Estimates of B0 are available for LIN3 and 4 combined, LIN 5 and 6 combined, and LIN 7. Estimates of biomass in 1997 are available for LIN3 and 4, and LIN 5 and 6.<br>There is considerable uncertainty about the status of small ling stocks in LIN1 and 2. |
| ***Monitoring***<br>Length/frequency<br>Age/length | There have been annual trawl surveys in LIN 3 and 4 since 1992 and every two years in LIN 5 and 6. Observer data is collected in LIN 3-7.<br>An industry logbook programme has been developed for longline fishing on the Chatham Rise. |

| Species: Orange Roughy | Current Information |
|---|---|
| ***Stock hypothesis***<br>Biology<br>Productivity<br>Stock structure | A number of separate orange roughy Fishstocks have been identified. DNA and allozyme frequency studies suggest that there are multiple fish stocks even within the Chatham Rise. Several spawning areas within the EEZ are known. The inter-relationship between/within the five main fisheries are not all known and work in this area is continuing.<br>Growth studies have been completed.<br>Research is planned to determine the indicative catch levels for new ORH fisheries on seamount features. Included in this research is a description of the physical characteristics of these seamount features, such as size, depth, and physical composition. It is anticipated that this information may provide a guide to approximate levels of sustainable yields and appropriate initial levels of catch. |
| ***Catch levels***<br>Catch versus quota<br>Recreational<br>Customary Māori<br>Illegal<br>Other sources of mortality | There has been a history of catch overruns in some ORH areas because of lost fish and discards. These overruns are now minimal. There have been large reductions in TACs for some areas - as large as 68% in one year (ORH2B) and 9,000 tonnes in one year (ORH 3B).<br>There is no quantitative information about the level of illegal catch of orange roughy. |
| ***Catch per unit of effort***<br>Catch rate | Analyses of CPUE have been carried out for all orange roughy Fishstocks with the exception of ORH 1 and ORH 10.<br>CPUE is used in ORH 2A (South), ORH 7A and ORH 7B as a means of estimating relative abundance. |

B.29[99e]



| Species: Orange Roughy | Current Information |
|---|---|
| ***Abundance*** Biomass estimates Techniques used | No estimate of current biomass for ORH 1.<br><br>Fishery independent biomass estimates have been made in ORH 2A North, 2A South, 2B, 3A, and those parts of 3B comprising Northwest Chatham Rise, Northeast Rise and Puysegur. However, these are based on egg production surveys which, due to uncertainty over egg mortality, are perceived as unreliable. Thus the assessment of the stock is uncertain.<br><br>Stock assessments have been conducted for all these fisheries and for those which CPUE data is available.<br><br>For that part of ORH 3B comprising South Chatham Rise there are no biomass indices.<br><br>The status of all ORH 3B stocks is uncertain, with some areas having high levels of uncertainty and others not having been assessed at all (South Chatham Rise). |
| ***Monitoring*** Length/frequency Age/length | There are now catch limits in the sub-areas within 3B which have been agreed between the industry and the Minister since 1992-93.<br><br>Length and age frequency data for all the major fisheries is collected annually by the Ministry and industry observers.<br><br>A decision rule has been developed to support the adaptive management programme for ORH 1. |

| Species: Rock Lobster | Current Information |
|---|---|
| ***Stock hypothesis***<br>Biology<br>Productivity<br>Stock structure | There is no evidence for a genetic subdivision within New Zealand of red rock lobster. However, there is subdivision on other than genetic grounds (onset of maturity, catch and effort patterns). Packhorse rock lobster forms one stock in Northern New Zealand.<br>Growth studies have been undertaken. In 1998 previous tagging survey data was reanalysed.<br>Recruitment has been estimated for some stocks. |
| ***Catch levels***<br>Catch versus quota<br>Recreational<br>Customary Māori<br>Illegal<br>Other sources of mortality | Quota management reports are thought to provide the most accurate information on landings. Other sources include Licensed Fish Receiver Returns, and Catch, Effort, and Landing Returns.<br>The Ministry provided estimates of Māori customary catches for some CRA Fishstocks for the 1995-96 fishing year. Updates of those estimates have not been made.<br>There are estimates for recreational catches in all CRA areas (CRA1-9). These estimates are based on telephone and diary surveys in 1992, 1993 or 1994. A new diary survey was scheduled to start on 1 December 1999.<br>The Ministry provides estimates of the illegal catches by Fishstock.<br>There are no quantified estimates of other sources of mortality, although it is known that the return of under size lobsters to the water and predation are sources of mortality. |
| ***Catch per unit of effort***<br>Catch rate | Standardised CPUE analysis has been used as the basis of a decision rule to manage rock lobster stocks using the 1992-93 year as an index.<br>CPUE is used as a measure of relative abundance for the length based model.<br>High grading can have a negative bias in the estimated CPUE. |

| **Species: Rock Lobster** | **Current Information** |
|---|---|
| ***Abundance*** Biomass estimates Techniques used | A stock assessment has been carried out for all Fishstocks in 1999, except for the Chatham Island stock which has not been updated since 1996.<br><br>A new length-based model has been developed. The Ministry notes that estimates of vulnerable biomass are made for the beginning of each assessment year. The new model is capable of determining $B_{MSY}$.<br><br>The new model has not yet been used in CRA3. A more simple model is used which is not capable of determining $B_{MSY}$. |
| ***Monitoring*** Length/frequency Age/length | The minimum legal size (MLS) in the commercial fishery for red rock lobster is based on tail width, except in the Otago fishery where it is tail length.<br><br>Commercial fishers are involved in a voluntary logbook programme. |

| Species: Snapper | Current Information |
|---|---|
| ***Stock hypothesis***<br>Biology<br>Productivity<br>Stock structure | Separation of stocks has previously been on the basis of genetic studies and other biological information. Studies suggest that 6 or 7 stock units may exist. SNA 1 has two sub-stocks (East Northland and Hauraki Gulf/Bay of Plenty).<br>Growth studies have been completed. |
| ***Catch levels***<br>Catch versus quota<br>Recreational<br>Customary Māori<br>Illegal<br>Other sources of mortality | There are records used by the Ministry for reported snapper landings extending back as far as 1931.<br>Diary surveys have provided estimates of recreational catch.<br>There is no quantification of Māori customary catch.<br>There is an estimate of 10% non-reported landing.<br>There is no estimate on the discard of fish. |
| ***Catch per unit of effort***<br>Catch rate | Relative abundance indices for SNA1 and 8 have been derived from CPUE analyses of longline and pair trawl catches respectively.<br>CPUE is a major component in the model used to assess the SNA8 Fishstock. |
| ***Abundance***<br>Biomass estimates<br>Techniques used | SNA1 estimate in 1994 from a large tagging programme. The results are taken to be absolute estimates of abundance for each sub-stock.<br>SNA2 has no estimate of biomass.<br>SNA8 biomass has been estimated. Tagging programme in 1990 gave estimate of absolute biomass. Other key parameters have been estimated. |
| ***Monitoring***<br>Length/frequency<br>Age/length | Water temperature is an important factor in the success of snapper recruitment. Water temperature is monitored and this information is used with catch at age data and the trawl survey indices to determine year class strength.<br>Catch at age is used in the age-structured model used to assess some snapper stocks.<br>Market sampling for all Fishstocks is ongoing. |

| Species: Hoki | Current Information |
|---|---|
| ***Stock hypothesis***<br>Biology<br>Productivity<br>Stock structure | There are two sub-populations of hoki. No genetic differences have been detected. Spawning grounds have been identified. Growth studies have been completed. Hoki recruitment has been studied.<br><br>Research has been conducted to determine the relationships between environmental variables and year class strength in the western and eastern hoki stocks. |
| ***Catch levels***<br>Catch versus quota<br>Recreational<br>Customary Māori<br>Illegal<br>Other sources of mortality | Recreational and Māori customary fishing for hoki is believed to be negligible.<br><br>No information is available about illegal fishing.<br><br>There may be dumping of small fish, but, if so, the level is unknown. Net damage has been recorded in the West Coast fishery in some years.<br>Net damage resulting in mortality is unknown. |
| ***Catch per unit of effort***<br>Catch rate | CPUE has been used extensively to estimate relative biomass.<br><br>CPUE data from the two main spawning fisheries from 1987-95 have been analysed using a range of alternative models. There are certain behaviours in the Cook Strait fishery which might invalidate CPUE as an index of abundance.<br><br>The Ministry says that CPUE analysis should continue to be monitored annually and used in the stock assessment for both hoki stocks. |
| ***Abundance***<br>Biomass estimates<br>Techniques used | Biomass estimates have been completed.<br>Data is collected by a number of sources: Acoustics, CPUE, trawl surveys.<br>Key parameters of the stock have been estimated.<br><br>Note: Hoki stock assessment is carried out separately for western and eastern socks using research time series of abundance (trawl and acoustic), catch and effort and catch at age data, and estimates of biological parameters. Results are presented by the Ministry from two alternative models – a NIWA model developed specifically for hoki and the Bayesian model used by New Zealand Seafood Industry Council Ltd. |

*… continued on next page*

| Species: Hoki | Current Information |
|---|---|
| | The Ministry engaged an independent, international expert to review hoki acoustic projects in 1998 and two experts to review the stock assessment in 1999. |
| ***Monitoring***<br>Length/frequency<br>Age/length | Since 1988 the Stock Monitoring Programme has carried out a programme of catch and market sampling in the main hoki fisheries, at sea by observers, and in the fish sheds.<br><br>Catch at age data is collected annually. Trawl surveys are also used annually on the Chatham Rise and two-yearly on the Southern Plateau. |