B14. SOUTHWEST PACIFIC

FAO Statistical Area 81

by Ross Shotton *

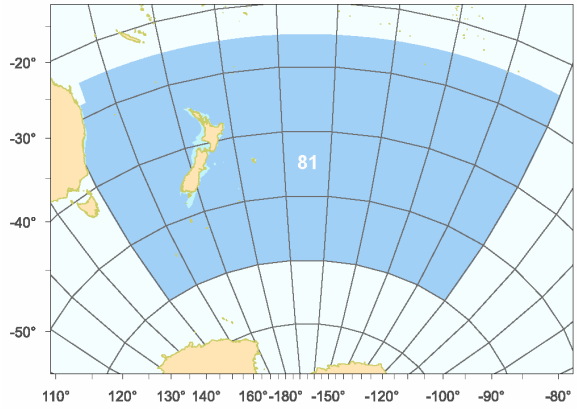

Figure B14.1 - The Southwest Pacific (Area 81)

INTRODUCTION

This area includes the Tasman Sea and the Pacific Ocean from the 150°E to the 120°E meridians (Figure B14.1). The total surface area is 27.7 million km^2 with only 0.4 million km^2 of shelf area. In the Tasman Sea the well-defined East Australian Current flows south along the East Coast of Australia but becomes weaker and diffused south of Sydney. Part of this current system turns eastward after coming in contact with the more southerly West Wind Drift along the northern edges of the Southern Oceans and southern margin of the Tasman Sea. It then turns northward along the two coasts of the South Island of New Zealand. On the east coast of New Zealand, this current encounters the south-flowing East Cape Current and where the two meet, they merge moving offshore forming the Wairarapa Gyre as they do so, which is situated above the Chatham Rise, a raised part of the sea bed extending to the Chatham Islands further eastward.

The region in general is characterized by deepwaters with many seamounts about which mesopelagic fish resources, e.g. orange roughy and oreos, are exploited. To the Southeast of New Zealand there is an extensive raised area, the Campbell Plateau, of around 200 m depth. Another more shallow area extends from the centre of New Zealand in a north-westerly direction, the Lord Howe Rise, continuing to the eponymous mid-Tasman Sea islands.

The types of habitats that are exploited in this area are most varied and support also most varied types of fisheries, from coastal continental to deepwater seamount fisheries. In fact, New Zealand and, to a lesser extent, Australia have been pioneers in developing profitable and continuing deepwater (>600 m) trawl fisheries. The fisheries resources consist of the coastal species of the Australian States of New South Wales, Northern Victoria and offshore Tasmania, and of New Zealand, the pelagic resources of the South Western Pacific and the mesopelagic species (of which the most important are orange

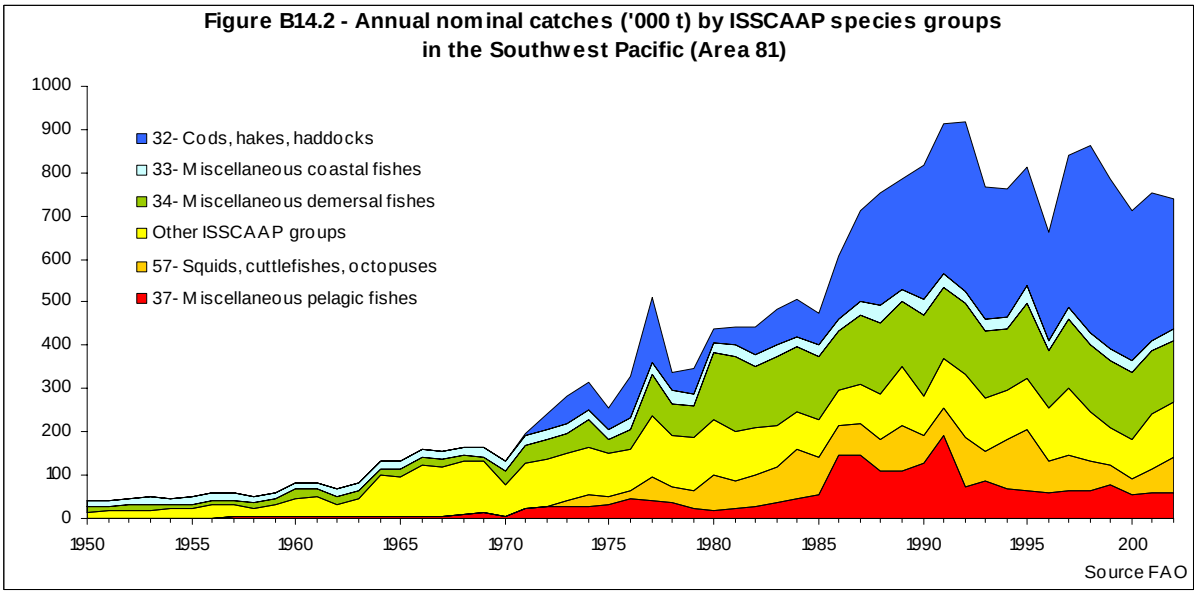

Figure B14.2 - Annual nominal catches ('000 t) by ISSCAAP species groups in the Southwest Pacific (Area 81)

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roughy (*Hoplostethus atlanticus*) and hoki (*Macruronus novaezelandiae*) associated with the sea bottom rises of the Tasman Sea, to the south and east of New Zealand and the deep water west of the South Island.

Figure B14.3 - Annual nominal catches ('000t) of selected species in ISSCAAP Group 32, Southwest Pacific (Area 81)

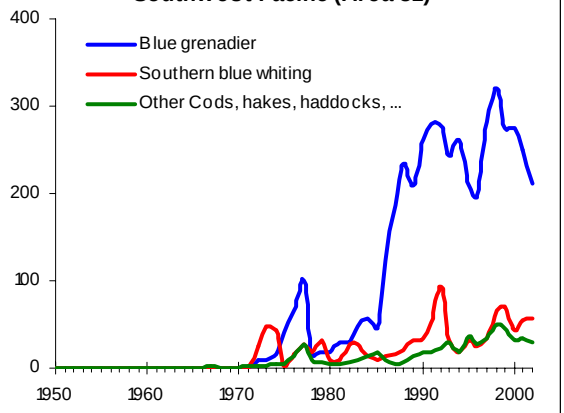


Figure B14.4 - Annual nominal catches ('000t) of selected species in ISSCAAP Groups 34 & 37, Southwest Pacific (Area 81)

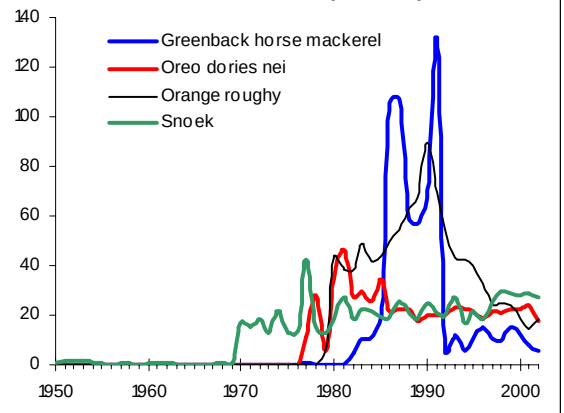
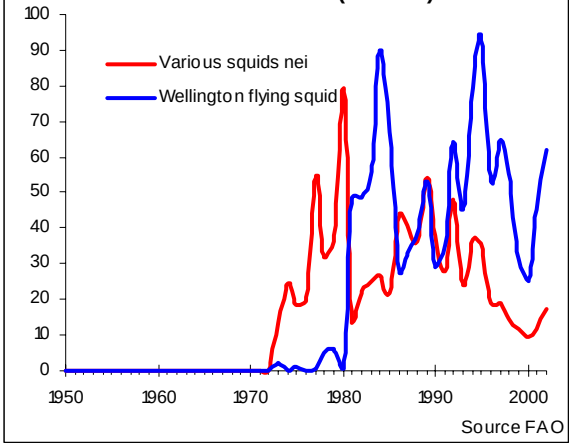


Figure B14.5 - Annual nominal catches ('000t) of selected species in ISSCAAP Group 57, Southwest Pacific (Area 81)



PROFILE OF CATCHES AND RESOURCE STATUS

Nominal catches from the Southwest Pacific increased from less than 50 000t in 1950 to 917 000t in 1992 and then gradually declined to 740 000t in 2002 (Figure B14.2 and Table D14). The Southwest Pacific has regularly been producing the smallest catches of all FAO Statistical Area since 1950. Four taxonomic groups account for 78.8 percent of the catches: gadids (40.4 percent), miscellaneous demersal fishes (19.2 percent), Miscellaneous pelagic fishes (8.2 percent) and squids, cuttlefishes, octopuses (10.6 percent), (Figures B14.2, 3 and 4). Highlights on catch trends and major changes in the area follow, together with a brief summary review of the status of the main fish stocks extracted from published material and other available information. In this context, of particular relevance are the fishery status reports of the Australia Department of Agriculture, Fisheries and Forestry (http://www.affa.gov. au) and the status of stocks of the New Zealand Ministry of Fisheries (http://www.fish.govt.nz). Table D.4 summarizes further the information on catch and trends and stock status.

Australia

The South East Fishery supplies most of the fresh fish to New South Wales, Victorian and Tasmanian markets. The fishery takes more than 100 commercial species, but 17 species or species groups provide the bulk (>80 percent) of trawl landings and are limited to total allowable catches (TACs) allocated as individual transferable quotas (ITQs). The 1999 and 2000 TACs for eastern gemfish were reduced to 250t and 200t, respectively, which allowed for bycatch only. Blue warehou (*Seriolella brama*) and orange roughy (southern management zone) TACs for 1999 and 2000 were also reduced. The 1999 TAC for school whiting (*Sillago* spp.) was reduced, whereas those for ling (*Genypterus blacodes*) and spotted warehou (*Seriolella punctata*) were increased. The 2000 TACs for jackass morwong (*Nemadactylus macropterus*) and orange roughy (western management zone) were reduced. All other TACs remained the same as in 1998. The number of active trawlers has decreased since 1992, but the total fleet capacity and horsepower have increased, and the annual fishing effort (hours fished) has almost doubled. Discarding of some species at sea, particularly in shelf waters, remains a major issue, but the total

discarded weight of quota species has fallen by about three-quarters between 1998 and 2000. Four species, lue warehou, eastern gemfish, orange roughy (except Cascade Plateau) and redfish are considered overfished; four, blue grenadier, jackass morwong, tiger flathead (*Neoplatycephalus richardsoni*) and ocean perch (*Helicolenus* spp.) are probably fully fished; and the status of nine (blue-eye trevally (*Hyperoglyphe antarctica*), eastern school whiting (*Sillago* spp.), John dory (*Zeus faber*), ling, mirror dory (*Zenopsis nebulosus*), royal red prawn (Penaeidae), silver trevally (*Pseudocaranx dentex*), spotted warehou and western gemfish (*Rexea solandri*) is uncertain (http://www.affa.gov.au/ontent/output.cfm?ObjectID=D2C48F86).

Individual transferable quotas were introduced for school shark (*Galeorhinus galeus*) and gummy shark (*Mustelus* spp.) in the Southern Shark Fishery from January 2001. Quotas also apply to school and gummy shark bycatch in the South East Trawl and Great Australian Bight Trawl fisheries. The 2001 total allowable catches were 432t for school shark and 2 159t for gummy shark. School shark are considered overfished and quotas for this species are in accordance with a harvest strategy intended to rebuild the adult biomass. Current gummy shark catches are likely to be sustainable. Recruitment of gummy shark to the fishery in Bass Strait appears to have been stable over the last 20 years. Although quotas are the primary management tool for the fishery, some input controls have been retained (http://www.affa.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A06482).

The South Tasman Rise is a large plateau rising to less than 1000 m from the surface south of Tasmania. Fishing has so far been on grounds shallower than 1200 m, in an area straddling the Australia Fishing Zone (AFZ). The principal target species are orange roughy (*Hoplostethus atlanticus*), smooth oreo (*Pseudocyttus maculatus*) and spiky oreo (*Neocyttus rhomboidalis*). These species form spawning aggregations in winter, which makes them vulnerable to fishing. Although there has been some exploratory trawling on the South Tasman Rise since the mid-1980s, catches were generally small, but in September 1997 significant aggregations of orange roughy were discovered and the fishery rapidly increased. As the bulk of these fish were taken outside the AFZ, the fishery attracted New Zealand vessels and during 1997 the two fleets made a total catch of over 2 000t of orange roughy and about 1 100t of oreos. Concern was expressed that uncontrolled fishing by both fleets would decimate the orange roughy population(s) of the rise. Fisheries officials agreed in late 1997 to establish a precautionary TAC for orange roughy within a proclaimed area of international waters encompassing the known fishery split between the two countries, 80 percent to Australia and 20 percent to New Zealand.

In February 1998, the orange roughy fishery expanded dramatically and 2 052t were landed by Australian vessels before either the Australa-New Zealand agreement or the TAC took effect. Australia's allocation of the orange roughy TAC under the terms of the MOU was 1 669t; New Zealand's was 431t. Subsequent landings by Australian and New Zealand vessels fishing within the 1998-99 TAC period totalled 1 194t and 404t, respectively. A further 346t were caught during research cruises so that close to 4 000t of orange roughy were taken in 1998. Management of this fishery was further complicated by the appearance of vessels from other states.

The status of the South Tasman Rise Trawl Fishery is uncertain. The size and extent of the orange roughy and oreo resources are currently unquantified and it is not known whether the "precautionary" TAC is sustainable. Despite considerable searching and fishing effort on the South Tasman Rise during the 2000-01 fishing year, only 830t of orange roughy and 290t of oreos were landed. This decline in landings could be influenced by environmental factors and it could also reflect a decline in resource size. The combined activities during 1999 of the Australian and New Zealand vessels and the four foreign freezer-trawlers may have had a significant impact on the fishery. The 2001-02 South Tasman Rise catch was only 188t of orange roughy and 25t of oreos, one-fifth of the catch in 2000-01. Fishing effort also declined markedly from 1 100 to 150 shots. The global TAC was reduced from 2 400t to 1 800t. Overall, with the closure of eastern fishing grounds, roughy landings from this Subarea collapsed, from 3 129t in 1997 to 28, 26, and 16t in the three following years.

New Zealand

New Zealand catches from FAO Area 81 have increased many fold, from 58 400t in 1970 to a

peak of 637 880t in 1998, followed by a small reduction to 556 844t in 2002, representing 129 species for which separate landing statistics are maintained. The major development in New Zealand's commercial fisheries has been the continuing expansion of landings of hoki (*Macruronus novaezelandiae*). In 2002, this species represented 34.6 percent of landings, an order of magnitude larger than the following species, the Wellington Flying squid *Nototodarus sloani* with 8.9 percent and southern blue whiting (*Micromesistius australis*) with 7.6 percent. Other important species are oreos (*Pseudocyttus maculatus*, *Allocyttus niger*, and *Neocyttus rhomboidalis*), Carangids *Trachurus* spp., snoek *Thyrsites atun* and ling *Genypterus blacodes*. In terms of the domestic markets, the species in main demand are snapper *Pagrus auratus* and tarakihi *Nemadactylus macropterus*, with catches in 2002 of 6 571t and 6 149t, respectively.

Hoki

Hoki (*Macruronus novaezelandiae*) are widely distributed throughout New Zealand waters from 34°S to 54°S, from depths of 10 m to over 900 m, with greatest abundance between 200 and 600 m (http://www.fish.govt.nz/sustainability/research/stock/status4.htm#hok). Large adult fish are generally found deeper than 400 m, while juveniles are more abundant in shallower water. Hoki migrate to spawning grounds in Cook Strait, the west coast of the south Island and the Puysegur areas in winter. Throughout the rest of the year the adults are dispersed around the edge of the Stewart and Snares shelf, over large areas of the Southern Plateau and Chatham Rise and the North Island. Juvenile fish (2-4 years) are found on the Chatham Rise throughout the year. Hoki spawn from late June to mid-September and have moderately high fecundity. Not all adult hoki spawn in a given year and winter surveys have found large hoki with no gonad development, at times when spawning occurs in other areas.

The main spawning ground is centred on the Hokitika Canyon. The planktonic eggs and larvae are dispersed north and south with the result that 0+ and one year old fish can be found in most coastal areas of the South Island. However the major nursery ground for juvenile hoki aged 2-4 years is along the Chatham Rise, in depths of 200 to 600 m. The older fish disperse to deeper water and are widely distributed on both the Southern Plateau and Chatham Rise. Growth is fairly rapid; juveniles reach about 27-30 cm total length at the end of their first year.

The hoki fishery was developed by Japanese and Soviet Union vessels in the early 1970s. Catches peaked at 100 000t in 1977, but dropped to less than 20 000t in 1978 when the EEZ was declared and quota limits were introduced. From 1979 on, the hoki catch increased to about 50 000t until an increased TACC (Total Allowable Commercial Catch) from 1986 to 1990 saw the fishery expand to a maximum catch in the 1987-88 fishing year of about 255 000t. The annual catch ranged from 175 000t to 215 000t during 1988-89 to 1995-96 fishing years but increased to 246 000t in 1996-97. The total catch for 1997-98 was estimated to be the highest ever at 269 000t, but the total catch decreased to 192 482t in 2002. The pattern of fishing has changed since 1987-88 when over 90 percent of the total catch was taken in the west coast South Island spawning fishery. The catch from this fishery declined from 1988-89 to 1996-97 while the catch from Cook Strait and Chatham Rise increased.

Historically, the main fishery for hoki has been in winter on the west coast of the South Island where they spawn. The aggregations concentrate in depths of 300-700 m around the Hokitika Canyon. Since 1988 another fishery has developed in Cook Strait, where spawning also occurs. Outside the spawning season, hoki disperse to their feeding grounds and substantial fisheries have developed on the Chatham Rise and in the Subantarctic in depths of 400-800 m. While the catch for the 1997-98 season was estimated to be the highest on record (269 000t), recent catches have been less than the total allowable commercial catch which is 250 000t.

A study of potential links between hoki recruitment and climate variation found a strong negative correlation between year class strength of the western stock and the Southern Oscillation Index in autumn. Year class strength in the eastern stock and south west weather patterns were strongly correlated. The results support suggestions that cooler conditions and negative SOI or “El Niño” conditions favour hoki recruitment.

In the most recent assessment of hoki stocks (Annala *et al.*, 2002a), it was concluded that the status of the two stocks was uncertain. The results that had been obtained were strongly influenced by the model assumptions and it was concluded that there was a need to explore a

wider range of model assumptions. The current spawning biomass is estimated to be between 30 percent and 48 percent B_0 for the Eastern stock and between 36 percent and 56 percent B_0 for the western stock. Estimated maximum constant yield MCY, (defined as "the maximum constant catch that is estimated to be sustainable, with an acceptable level of risk, at all probable future levels of biomass") for the two stocks lies between 186 000t and 238 000t and current annual yield estimates for 2002/03 are between 177 000t and 384 000t. The assessment group concluded that the eastern stock may not be at a low level.

It is of note that the Hoki fishery is one of the few large volume fisheries that have been certified by the Marine Stewardship Council (certified in March 2001).

Southern blue whiting

Southern blue whiting (*Micromesistius australis*) is a schooling species that is almost entirely restricted to sub-Antarctic waters where they are dispersed throughout the Campbell Plateau and Bounty Platform for much of the year (http://www.fish.govt.nz/sustainability/research/stock/status6.htm#sou). During late winter they spawn near the Campbell Islands, on Pukaki Rise, on Bounty Platform, and near Auckland Islands over depths of 250-600 m.

There was a USSR fishery during the 1970s and early 1980s, and catches peaking at almost 50 000t in 1973 and again at almost 30 000t in 1979. The Japanese surimi vessels entered the fishery in 1986 and catches gradually increased to a peak of 76 000t in 1991-92. A catch limit of 32 000t, with area sub-limits, was introduced for the 1992-93 fishing year. Landings have averaged 58 200t in the last five years; the majority of the catch is currently taken by chartered Japanese surimi and Russian vessels.

The catch limits have not been reached on most grounds and in most years since their introduction. This appears to reflect the low economic value of the fish and difficulties in timing experienced by operators in this fishery rather than low stock sizes. On the Bounty Platform the amount of fishing effort in any season depends largely on the timing of the west coast hoki fishery. If there is a delayed hoki season then the vessels remain longer on the hoki grounds and miss the peak fishing season on the Bounty Platform. On the Pukaki Rise operators tend to have a small allocation and find it difficult to locate large aggregations of fish. On the Campbell Island Rise catches have increased over the past three seasons but are still lower than the catch limit. In the past 4 years fishing has extended into October and the reported catch by fishing year is different to that for the fishing season.

The fish are reaching a length of about 20 cm FL after one year and 30 cm FL after two years. Individual fish may reach an age of 25 years. The majority of females matures at age 3 or 4 at a length of 35-42 cm. Ageing studies have shown that this synchronized batch spawners have high recruitment variability. Four spawning areas have been identified on Bounty Platform, Pukaki Rise, Auckland Islands Shelf, and Campbell Island Rise. Spawning appears to occur at night, in midwater, over depths of 400-500 m on Campbell Island Rise but shallower elsewhere. It is assumed that there are four stocks of southern blue whiting: the Bounty Platform stock, the Pukaki Rise stock, the Auckland Islands stock, and the Campbell Island stock.

Updated estimates of biomass and yield have been made for the Bounty and Pukaki stock based on analysis of catch at age and acoustic survey data. But, no new assessments are available for the Campbell Island Rise stock. No assessment has been made of Auckland Island Shelf stock. In the case of the Bounty Platform stock, the current annual yield is, based on one set of modelling assumptions, estimated to be 2 000t with a range of 700-4 300t. Annala *et al*. (2002b) note that stock biomass has declined since 1993 with poor recruitment to the stock. Recent catches have been lower than the total allowable commercial catch of 8 000t, though the high estimate was accepted as more likely by the assessment working group. It was noted that stock recovery will depend on future good recruitment.

Oreos

New Zealand undertakes commercial fisheries for black oreo *Allocyttus niger*, smooth oreo *Neocyttus rhomboidalis* and some spiky oreo *Pseudocyttus maculatus*, (http://www.fish.govt.nz/sustainability/research/stock/status4.htm#ore). The Chatham Rise is the main fishing area, but other fisheries occur off Southland on the east coast of the South Island, in the Puysegur-Snares-Macquarie Ridge area south of the South Island

and in the Bounty/Pukaki area. Smooth oreo occurs from 650 to about 1 500 m and black oreo from 600 to 1 300 m depth. Oreos appear to be southern species and are abundant on the south Chatham Rise, along the east coast of the South Island, the north and east slope of Pukaki Rise, the Bounty Platform, the Snares slope, Puysegur Bank and the northern end of the Macquarie Ridge. They probably occur right round the slope of the Campbell Plateau.

Total oreo catch was 18 000t in 2002 compared with 21 614t in 1990-01. Catches from the Puysegur fishery declined markedly in 1994-95 and remained low in 1995-96 and 1996-97, however, by 2000-01 there had been a substantial recovery to 48 562t.

The increased use of the generic species code OEO (Oreos) as the target species in catch effort data is potentially a problem in analysing these data for standardized CPUE analyses. Dumping of unwanted or small fish and accidental loss of fish (lost codends, ripped codends, etc.) were features of oreo fisheries in the early years. This source of mortality was probably substantial in early years but is now thought to be small.

Spawning of smooth oreo is widespread on the south Chatham Rise and appears to take place in small aggregations. Mean total length at maturity for females, estimated from Chatham Rise trawl surveys (1986–87, 1990, 1991–93) using macroscopic gonad staging, is 40 cm for smooth oreo and 34 cm for black oreo. These species appear to have a pelagic juvenile phase, of which little is known. The pelagic phase may last for 5–6 years to total lengths of 16–19 cm for smooth oreo *Neocyttus rhomboidalis* and 4–5 years to lengths of 21–26 cm for black oreo *Allocyttus niger*. Ageing indicates that oreos are slow growing; the estimated maximum age of Smooth oreo is 86 years (51.3 cm); for black oreo, the maximum estimated age is 153 years (45.5 cm fish).

The three species of oreos (black oreo, smooth oreo and spiky oreo) are managed as if they were one stock though each species could be managed separately as they have different depth and geographical distributions, different stock sizes, rates of growth and productivity.

FISHERY MANAGEMENT

Australia

Management of Australia's fisheries is a complex mix of Commonwealth and State responsibility with the States managing the fisheries out to 3 nautical miles from shore and the Commonwealth managing those beyond that to the 200 mile limit. Under the Offshore Constitutional Settlement, agreement has been reached to place many fisheries under single jurisdiction, either Commonwealth, State or Territory. Commonwealth Fisheries are managed by the Australian Fisheries Management Authority (AFMA) under the Fisheries Management Act 1991 and the Fisheries Administration Act 1991 (Caton, McLoughlin and Staples, 1997), (http://www.afma.gov.au/plans/afmapercent20annual percent20operational percent20plan percent202001-2002/default.php).

The Annual Operational Plan has been prepared in accordance with the requirements of Section 77 of the *Fisheries Administration Act 1991* and specified Government legislation and guidelines including the provisions of the Commonwealth Authorities and Companies Orders for the Report of Operations to which AFMA is subject under the *Commonwealth Authorities and Companies Act 1997*. This Plan describes how the AFMA will pursue its objectives for the 2001-2002 year and specific actions that the Authority proposes to take to achieve the longer term directions contained in AFMA's Corporate Plan for 2000-2005. The Plan also contains performance information and details of AFMA's budget, resourcing policies and internal performance improvement program and proposes action to implement AFMA's Strategic Human Resource Development Plan. Both the Corporate Plan and the Operational Plan are based upon the legislative objectives set out in the Administration Act and the *Fisheries Management Act 1991* and provide the information against which AFMA's performance may be measured and reported through the Annual Report. AFMA's focus for 2001-2002 continues to be on developing, implementing and refining the management arrangements, systems, policies and processes that underpin the sustainable, economically efficient and cost-effective management of Australia's Commonwealth fisheries.

Australian fisheries are undertaken within a comprehensive Oceans Policy (http://www.oceans.gov.au/read_the_policy_v1.jsp) that sets in place the framework for integrated and ecosystem-based planning and management for all of Australia's marine jurisdictions. It includes a vision, a series of goals and principles and policy guidance for a national Oceans Policy. Building on existing effective sectoral and jurisdictional mechanisms, it promotes ecologically sustainable development of the resources of the oceans and the encouragement of internationally competitive marine industries, while ensuring the protection of marine biological diversity.

At the core of the Oceans Policy is the development of Regional Marine Plans, based on large marine ecosystems, which will be binding on all Commonwealth agencies. The first Regional Marine Plan will be developed for the south-eastern region of Australia's Exclusive Economic Zone. Broadly, this will include waters off Victoria, Tasmania, southern New South Wales and eastern South Australia.

A major new initiative for marine research in Australia has recently been announced (http://www.csiro.au/index.asp?type=blank&id=Flagship_Oceans). This programme, noting that Australia's marine jurisdiction is likely to be the world's largest under the United Nations Convention on the Law of the Sea (70 percent of Australian territory) is aimed at bringing together science and industry to tackle key challenges in this vital field.

New Zealand

Fisheries management in New Zealand is undertaken within a Strategic Framework that seeks the achievement of sustainable fisheries in a healthy aquatic ecosystem (http://www.fish.govt.nz/sustainability/research/planning/strategic_plan2.htm). *The Fisheries Act 1996* restates and enhances sustainability policies within New Zealand's fisheries waters and provides for more explicit environmental standards and gives further opportunities for the users of the fisheries to accept increasing responsibility for management. From the Fisheries Act 1996, "ensuring sustainability" means (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. The Fisheries Act 1996 also requires that in utilization of fisheries resources (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.

The 1996 Fisheries Act and the Government's Environment 2010 Strategy are the twin foundation stones of the Ministry of Fisheries long-term strategic focus as articulated in Changing Course - Towards Fisheries 2010. Changing Course sets out the framework for developing the strategy to manage fisheries into the future. It identifies several requirements: (a) Inter-generational equity; (b) biodiversity; (c) environmental bottom lines; (d) the precautionary principle; (e) research, science and technology; (f) protecting international competitiveness; (g) sustainable property rights; (h) least-cost policy tools; (j) pricing of infrastructure; (k) internalization of external environmental costs; (l) defining the limits of fishery resource use and substitution and (m) social costs and benefits.

In 1986, New Zealand introduced a comprehensive quota management system (QMS) to manage and conserve the major commercial fisheries within the New Zealand 200 nautical mile Exclusive Economic Zone (EEZ). The primary objectives of the quota management system are to ensure sustainable catches over the long term while providing for these to be harvested efficiently and with maximum benefit to New Zealand.

Within the quota management system, Individual Transferable Quotas (ITQs) have been issued for 42 species, or groups of species, covering 257 separate fish stocks. ITQs provide the owner with an ongoing property right to a portion of the annual harvest of a fish stock, which can be traded, leased or caught. The quota management system has successfully replaced traditional fisheries management methods (using input controls) and has facilitated the rationalization of investment in vessels and onshore plants by providing quota owners with the incentives to minimize costs and maximize product values. New Zealand’s Seafood Industry is paying full costs for Government services of management and research and receiving no subsidies.

Total Allowable Catches (TACs) are set for each fish stock to maintain the population size at, or above, that which can produce the maximum sustainable yield (B_{MSY}). Determination of a TAC under the MSY objective relies on estimation of the current biomass and of the productivity of the stocks to determine either the Maximum Constant Yield (MCY) or the Maximum Average Yield (MAY). Maximum constant yield is based on taking the same catch from the fishery year after year and is defined as *"the maximum constant catch that is estimated to be sustainable, with an acceptable level of risk, at all probable future levels of biomass"*. A maximum average yield strategy is based on the estimation of the Current Annual Yield (CAY), recognizing that population sizes change from year to year, independent of fishing mortality. Current annual yield is obtained by applying a reference fishing mortality to an estimate of next year's fishable biomass. Over time, a current average yield strategy allows the estimation of the Maximum Average Yield (MAY), which is used to interpret MSY.

Stock assessments for each of the major fisheries are reviewed annually. The Ministry of Fisheries holds annual consultations to determine fisheries research requirements and to review the results of stock assessments for advice to the Minister. Research projects, to assess the status of fisheries, are let by tender by the Ministry of Fisheries. Stakeholders, including the Seafood Industry, Maori, recreation and conservation interests, are actively involved in the research planning, stock assessment and management review processes. However, still by 1997, the status of 64 percent of the 149 stocks in the Quota Management System was unknown. While the initial TACs in 1986 were set below the historical catch to promote stock rebuilding inshore finfish species, the extent to which stock rebuilding has occurred for many of these species is unknown.

Management by quota of the major species in New Zealand fisheries has enhanced the fish stocks and economics of New Zealand fisheries over the last twelve years, a period when the resources and economics of similar fisheries have been depleted in other countries. The Seafood Industry is paying the full costs for fisheries management, enforcement and research, an annual investment of 3 percent of gross returns. Government investment in fisheries related research is very low compared with its investments in other primary sectors.

Recent developments by the Government have included an Independent Review of the Fisheries Act 1996 which resulted in recommendations that: (1) the roles of Government and fisheries stakeholders be fundamentally realigned; (2) transparent, integrated consultation and decision making processes be implemented; (3) the Quota Management System be simplified and made less prescriptive and (4) some responsibility for fisheries management be handed to fisheries rights holders.

The Government accepted the recommendations and began introducing legislation to bring the fisheries management regime into line with the recommendations. The key features of the amendment are: (1) providing for integration of fisheries management, including approval of fisheries plans; (2) a new catch balancing regime based primarily on civil, rather than criminal, penalties; (3) a new cost recovery regime and (4) allowing commercial fisheries administrative functions to be devolved to private organizations

Other amendments include provisions such as: (1) enabling certain by-catch stocks to be managed below maximum sustainable yield; (2) enabling fishers to carry forward into the next fishing year up to 10 per cent of any annual catch entitlement that has not been fully caught; and (3) enabling a new non-Individual Transferable Quota (ITQ) fishing permit to be issued to a relative of a permit holder who has died, despite the moratorium.

The *Fisheries Act 1996 (No. 2) Amendment Act 1999* has enabled New Zealand to control the fishing activities of New Zealand-flagged vessels and nationals on the high seas.

In the last year, there was been a major enquiry into the allocation of quotas, prompted by concerns as to how rights were obtained in the recently-developed scampi (*Metanephrops challengeri)* fisheries. A major milestone has been the finalization of a proposal for allocation of catch rights to indigenous fishermen.

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